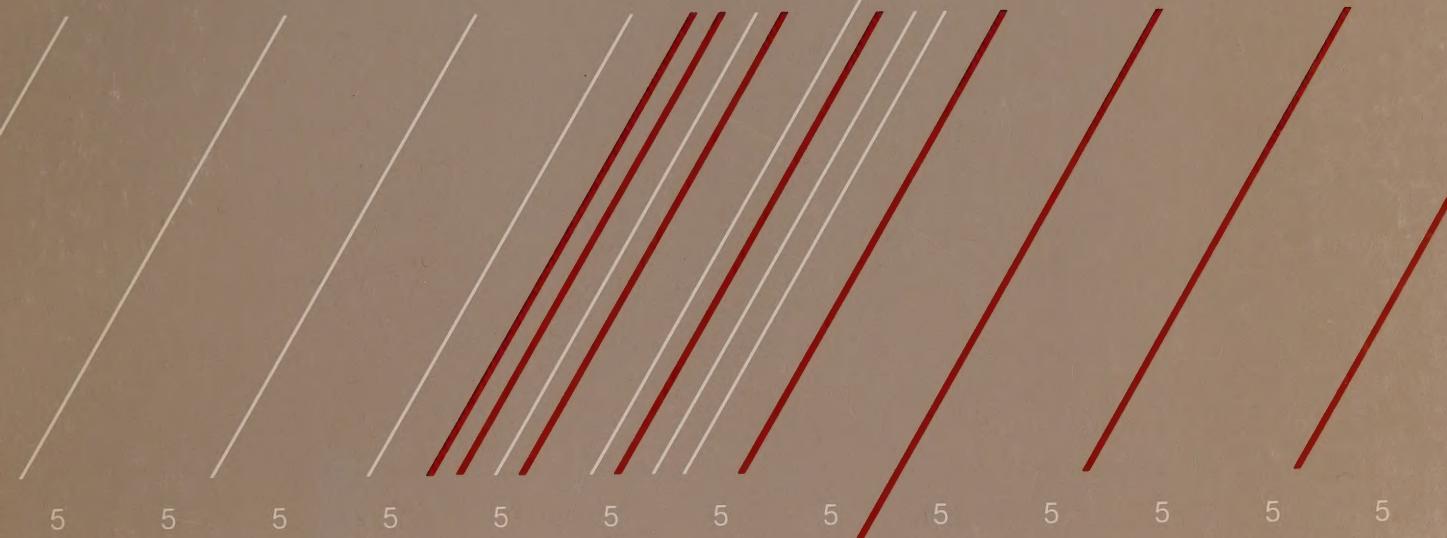
The Ontario
Task Force on
Employment and
New Technology



Employment and New Technology in the Iron and Steel Industry

An Appendix to the Final Report

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

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APPENDIX 5

EMPLOYMENT AND NEW TECHNOLOGY

IN THE IRON AND STEEL INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

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FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May 1984 "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the rear of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Iron and Steel Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

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The Board of Industrial Leadership and Development (BILD) of the Government of Ontario.

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The Ontario Ministry of Labour.

The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study was greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE IRON AND STEEL INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

July, 1985

Submitted By: Maureen Farrow
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& Lybrand
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EMPLOYMENT AND NEW TECHNOLOGY IN THE IRON AND STEEL INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Iron and Steel Mills (SIC 291)[2]. The report includes four parts.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.

- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1984 which provides background and a perspective on the industry's historical development.

- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

  - a review of recent and anticipated technology adoptions,

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1 Manpower and Employment Implications of New Technologies in Selected Manufacturing Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

2 1970, Standard Industrial Classification (SIC), Statistics Canada.

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Iron and Steel Industry were identified using the 1982 Census of Manufacturers.[1] All firms with five hundred or more employees were included in the sample frame. Employment in these firms is estimated to include 96% of the 41,603 employees (1982) in the Iron and Steel Industry in Ontario.

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1 Manufacturing Industries of Canada: National and Provincial Areas, 1982, Statistics Canada, Catalogue No. 31-203.

The total number of firms in the industry in 1982 was 17, of which 7 had five hundred or more employees. This latter group of firms, with five hundred or more employees, was the base for selecting a sample of firms for the survey. Table 1, below, shows the number of firms in the sample frame, by size.

A representative, random sample of firms, stratified by employment size categories (see Appendix A), was chosen from the sample frame. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual.

A search was carried out of the Ontario Ministry of Labour Collective Agreements Library to identify unions in the sample firms. Union head offices were contacted to identify the appropriate union leader in each of the unionized firms in the sample. The same questionnaire was sent to union representatives. A copy of the survey questionnaire is attached as Appendix B, together with an outline of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms and unions who participated in the sample survey are shown in the table.

---

1 The number of firms should not be confused with the number of establishments (23 in 1982). Establishments are production centres. Therefore, a firm may have more than one establishment.

1I TABLE 1: IRON AND STEEL MILLS SIC 291

Number of Firms and Unions Responding
By Firm Employment Size

Firms by Employment Size	Number of Firms	Number of Unions	Number of Firms in Sample Frame (1)
Total Firms, Large (500+)	3	1	7

(1) SOURCE: Statistics Canada, CENSUS OF MANUFACTURERS, 1982.

In most cases, several participants in each organization contributed to the completion of a questionnaire. In the Iron and Steel Mills survey, an average of 1.7 participants contributed to a firm questionnaire and 1.0 participants to a union questionnaire. The companies' principal participants had an average of 19 years' experience with their firms and 19 years in the industry. The union's principal participant had 7 years experience with the industry.

The sample survey results have been weighted up to the number of firms in the sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with 500 or more employees in the Iron and Steel Mills (SIC 291) in Ontario. Reliability of the sample is estimated at 90 percent, with a 23 percent allowable error (See Appendix C for an explanation of the sample reliability calculation method).

> Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The next chapter of the report discusses the historical analysis and subsequent chapters review the results of the sample survey and expert consultation which discuss the anticipated trends for the period 1985 to 1995.

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This report provides an historical analysis of the Iron and Steel Industry trends for the period 1971 to 1981 and 1982 to 1984. In 1982, Iron and Steel Mills accounted for $5.7 billion or 3 percent of total manufacturing shipments in Canada and $4.7 billion or 5 percent of total manufacturing shipments in Ontario. Measured in terms of manufacturing shipments, the Iron and Steel Industry was Ontario's fourth largest manufacturing industry in 1982 following motor vehicle manufacturing, petroleum refining and motor vehicle parts and accessories manufacturers.

Iron and Steel Mills SIC 291 includes four main types of establishments:

- Establishments primarily engaged in manufacturing pig iron and ferro-alloys.

- Steel works primarily engaged in manufacturing ingots, steel castings and in continuous casting of steel.

- Rolling mills primarily engaged in hot and cold rolling of steel into primarily shapes.

- Coke ovens operated in connection with blast furnaces.

In some cases, the blast furnace, steel mill, rolling mill and coke oven or some combination of two or more of them are carried on as one integrated operation and the manufacturing processes may be carried on beyond the rolling mill stage.

The Iron and Steel Industry in Ontario is dominated by three large integrated firms - Stelco Inc., Dofasco Inc. and Algoma Steel Corporation Limited. The fifty remaining firms are much smaller

by comparison and tend to be classified as non-integrated or semi-integrated plants which concentrate in particular product lines.

2.1 The Structure of the Industry

This section presents a profile of the major steel producers in Ontario. Table D.1 shows the capacity of the principal steel producers. The tables for this section of the report are presented in Appendix D, Historical Tables.

2.1.1 The Principal Steel Producers

Stelco Inc.

Stelco is Canada's largest steel producer with 33.1 percent of Canada's raw steel capacity, located in four major plants at Hamilton, Nanticoke, Contrecoeur, and Edmonton, and with rolling and finishing facilities at those places and elsewhere in Central Canada, Saskatchewan and Alberta. Stelco has Canada's most diverse product mix in the steel industry.

Principal products are:

- Plate.
- Hot rolled and cold rolled sheet.
- Continuous galvanized sheet.
- Prepainted sheet, in coils.
- Tin plate.
- Hot rolled and cold finished bars.
- Wire and strand.
- Wire rods.
- Reinforcing bar, welded wire fabric, grinding balls, rods, grader blades, agricultural implement parts.

- Fasteners.
- Continuous welded steel pipe.
- ERW welded steel pipe.
- Steel tubing.

While no data is available on the relative importance of various products in Stelco's product lines, plate, sheet and strip and tubes are considered to be the major products.

Sales and earnings of Stelco showed steady improvement from 1975 to 1981. A strike in 1981 impacted negatively on both sales and earnings, as did the recession in 1982 and 1983. The partially completed facilities at Nanticoke will prove a burden until rolling mill and raw steel facilities are in better balance.

Dofasco Inc.

Dofasco's product mix is heavily oriented towards consumer oriented steel products. Basic products include sheet and coils in hot and cold rolled steel, galvanized sheet, and steel castings. In a plant in Calgary, Dofasco produces small diameter tubular steel products for the oil, gas and construction industries and, in a subsidiary in Hamilton, railway rolling stock.

Principal markets are:

- Auto industry (hot rolled sheet, coil and strips, frames, wheels and miscellaneous stampings),

- Construction and agriculture (sheet),
- Oil and gas (skelp used in tubing),
- Food, beverages and perishable goods - electrolytic tin plate and chromium coated steel used in containers for food, beverages and perishable goods; ceramics, caps and aerosol containers.
- Electrical transmission - electrical steel,
- Residential - enamel sheeting,
- Railway equipment - carbon alloy and stainless steel castings.

Dofasco's production is concentrated at its fully integrated steel plant at Hamilton.

Sales and earnings have performed well. Dofasco has, traditionally, had the most stable earnings and highest rate of return of the integrated steel producers. The absence of a unionized work force has avoided production disruption as a result of work interruption. Earnings declined in 1982 but were strong relative to other companies. The strong improvement in earnings during 1983 and 1984 have reflected the recovery of the automobile industry. Dofasco has recently announced a major capital investment program to update facilities, and in particular to move to continuous casting.

Algoma Steel Corporation Limited

Algoma has the product mix most heavily oriented among the integrated steel producers to the capital goods

industries. In addition, Algoma is Canada's only producer of heavy structurals, the dominant producer of rail, and the only producer of seamless tubes, which are used in deep drilling in both Canada and the United States.

Production is at a single integrated plant at Sault Ste. Marie, which makes Algoma the most western location of the integrated steel mills.

Traditionally, seamless tubes (oil and gas), rail (railway industry), and heavy structurals (construction) all of which are used by capital intensive industries, have been the major sources of net income. Plate produced by Algoma is used primarily in railway car manufacture and maintenance and shipbuilding. Since Algoma currently lacks an integrated pipe mill, it has not been a major supplier of skelp for line pipe requirements. Sheet is shipped primarily to the automobile industry and the farm equipment industry. Algoma is an important supplier of plate and sheet for structural steel fabrication, through AMCA (Dominion Bridge).

Historically, Algoma showed an excellent earnings performance during the post war years until sharply rising interest rates reduced capital investment in Canada. Since that occurred, and backlogs were reduced, Algoma's earnings have been poor.

Lake Ontario Steel

This firm supplies light structurals and reinforcing bar, primarily in the Toronto and Ontario markets. Markets are largely local.

Ivaco

Ivaco is located in Eastern Ontario, and has substantial reinforcing bar, hot and cold rolled bar and merchant production. Markets are largely local.

Burlington Steel

Burlington Steel is a division of Slater Steel. The Burlington Steel Division of Slater Steel operates a specialty mini-mill, producing carbon and alloy steel in three electric furnaces. The mill produces bar quality steels, commercial beams, channels and special shapes for steel warehouses and the automotive, agriculture and utility markets. An affiliated company manufacturers hardware for use in transmission and distribution of electrical power, commonly known as pole line hardware.

Atlas Steel

This firm is a specialty steel producer located at Welland.

2.1.2 The Product and Consumption Profile of the Canadian Steel Industry

Table D.2 shows the principal categories of rolled steel products shipped by the Canadian steel industry and Table D.3 shows the disposition of these products to the principal consuming industries.

2.2 The Market Environment

2.2.1 The Post War II Period, 1950-1980

While the steel industries of many industrialized nations began to experience difficulties by the mid-1970's, the long term performance of Canada's steel industry has been a success. This success was reflected by substantial growth in production facilities designed to (1) keep pace with Canadian steel demand, (2) replace imports and (3) selectively build up exports (particularly to the United States). Substantial new capital investment was made throughout the 1970's in coke oven batteries, blast

furnaces, BOF steelmaking shops, slab casters, rolling mills, and expansion of mining operations and other steelworks facilities. Among many performance indicators, a high level of capacity utilization and profitability have been the hallmark of Canada's steel industry, particularly by comparison to those in the United States and Europe. Table D.6 shows the industry's capacity utilization ratio for the years 1971 to 1983.

The rapid growth phase of the demand in the Canadian steel market came to an end in the mid 1970's. Table D.4 shows the domestic shipments, imports, apparent consumption, exports and total Canadian shipments of total rolling mill products.

Total consumption of rolling mill products reached 12.2 million metric tonnes in 1974, a level which was almost matched again in 1979 and in 1981. With 1983's total apparent consumption likely to have reached 9.1 million metric tonnes, it is evident that it will take at least 2 or 3 years of sustained growth in the economy and a recovery in business capital spending before the earlier peaks of steel consumption will again be reached. It should be noted that because inventory data is generally not available, the apparent consumption figures are distorted both at the peak and the trough of the Canadian steel consumption cycle.

While total steel consumption has only intermittently returned to its 1974 peak, shipments by Canadian steel mills have continued to grow as a result of (a) import replacement and (b) a build-up of exports.

During the 1950's, imports supplied between 25 and 30 percent of Canada's steel requirements. This ratio declined substantially during the 1960's and 1970's,

although at the peak of the demand cycle - such as in 1965 and in 1974 - additional imports provided a temporary additional source of supply. A substantial part of this import replacement was the result of growth in specialty areas in Canadian steel demand to a point where Canadian demand was adequate to sustain domestic production in products such as continuously galvanized coiled steel, wide flanged beams and seamless tubular casings. From 1979 to 1983, the ratio of imports to apparent steel consumption averaged 12.3 percent.

Also, exports of rolling mill products by Canadian steel producers have been on a long term rising trend. From the late 1950's through to the mid 1970's, exports as a percent of total Canadian mill shipments generally fluctuated between 10 and 15 percent. By comparison, the average during the years 1979 to 1983 was just under 20 percent. As a result of these import and export trends, the Canadian steel industry has become a sizeable net exporter of steel in recent years, by comparison to the earlier trade deficit position.

2.2.2 The Present Cyclical Situation

Steel consumption was hard hit by the economic weakness of the early 1980's. The results for 1983 indicate only a modicum of improvement and it will take 3 or 4 years of a sustained recovery until the 1979 peak volumes of total steel production are reached again.

Large segments of the world's steel industry are still unprofitable and suffering from excessive debt burdens. Rationalization and restructuring is occurring on a widespread scale in the steel industries of Europe, the United States and even in Japan. Thus, steel industries in industrialized nations are in the process of adjusting

to the changing market circumstances and will emerge from this process (1) smaller in absolute scale (effective crude steel production capacity), but (2) more efficient and better capable of competing in a tough market environment. The United States' industry, in particular, is in the process of radical change. Widespread plant shutdowns, rationalization and mergers are taking place and "weak" companies still have to make "survival" investments.

By contrast, the steel industries of many developing nations are still expanding, despite an environment that mandates national belt tightening to meet debt service costs. Their industries, often starting from scratch, have been able to acquire state of the art technology. By comparison to the developed nations, many of these countries have low relative unit labour costs. (Table D.5). In cases such as Brazil and Mexico, these industries are also hard pressed to export to earn badly needed foreign exchange.

Interaction of these diverse forces is felt in world steel trade channels. The United States has had steel trading disputes with the European countries and more recently also with the aggressive steel trading practices of developing debtor nations such as Brazil. While Japanese steel exports are still large, they are usually not a focal point in these confrontations; rather it is Japan's steel using industries, such as automobiles, that command attention in the world trading arena.

For several years the international steel trade environment has thus felt the pressure of these competitive disputes. The tension is evident particularly in the United States where the high exchange rate for the United States dollar has exacerbated problems for domestic producers.

Through to the mid 1980's the international steel trade environment, and particularly U.S. steel market conditions, will remain difficult - and worse than that if the U.S. imposes import quotas from which Canadian steel is not exempted.

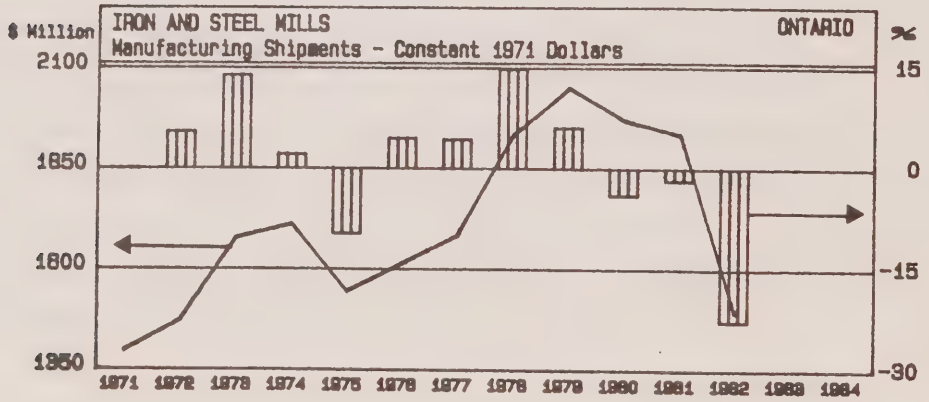
The subsequent improved international steel market environment will lead to a firming of prices and profit margins. However, competition will remain keen, as restructured and modernized industries operate in a marketplace that will still only be characterized by modest growth potentials.

2.3 Industry Trends

Tables D.6 to D.9 present key industry indicators for the years 1971 to 1984.

2.3.1 Aggregate Output

EXHIBIT 1



The Ontario Iron and Steel Industry experienced substantial growth over the 1971 to 1981 period. Current dollar manufacturing shipments rose from $1,394.5 million to $5,610.4 million. In constant dollars, manufacturing shipments increased at an average annual rate of 3.3

percent over this period from $1,394.5 million to $1,932.6 million. The industry experienced strong growth between 1971 and 1974, with the volume of shipments rising by 22.6 percent or by an average of 7 percent a year. During the 1974/1975 business cyclical recession the volume of shipments declined in 1975 to be followed by a strong recovery from 1976 to 1979 when the volume of shipments rose by 27.1 percent (8.3 percent a year on average). The year 1979 marked the high in the level of constant dollar shipments.

Following the 1979 high level of operations, Ontario's steel industry experienced a moderate setback in business activity through the first half of 1980. The decline in domestic steel demand was cushioned by a reduction in imports and an increase in exports. As the economy recovered momentarily from mid 1980 to mid 1981 (and capital spending in Canada remained strong), domestic demand improved. However, in 1982 the roof fell on the economy with a substantial negative impact on the steel industry. In both 1980 and 1981 the volume of manufacturing shipments declined by 4.0 percent and 1.8 percent respectively. However, in 1982, shipment volumes declined by 22.7 percent.

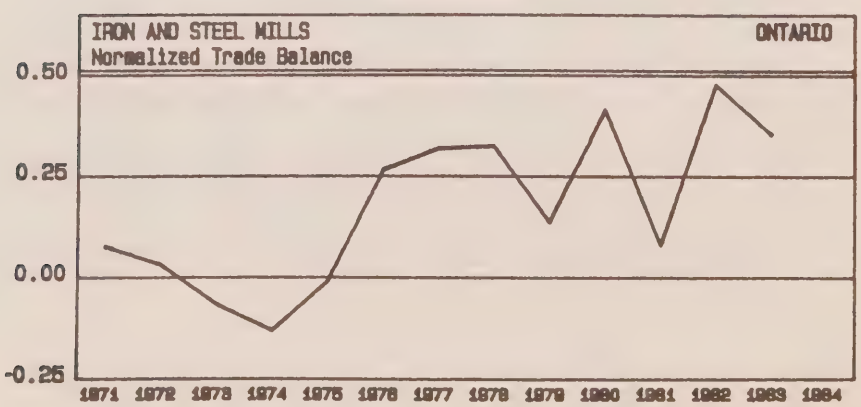
The large declines in demand were evident virtually all across the large steel consuming industries (with the exception of containers). They were particularly pronounced in those products of the steel industry oriented to capital spending, which dropped precipitously not only because of the deep economic downturn, but also because of the continuation of high real interest rates. Plate shipments were particularly hard hit - declining from 1.8 million metric tonnes in 1981 to 1.1 million metric tonnes in 1982 (38 percent in unrounded figures) - while total pipe and tube shipments fell by 43 percent (from 2.04 million metric tonnes to 1.16 million metric tonnes).

The economic recovery which began at the end of 1982 produced mixed results for the Canadian steel industry during 1983. Both domestic shipments and apparent consumption rose by 17 percent (imports increased by approximately 11 percent from 0.9 million tonnes in 1982 to 1.0 million tonnes in 1983). The heavy inventory liquidation came to an end by mid year, and even though no immediate return to large scale inventory rebuilding is in the offing, this is at least bringing shipments and final demand closer into line. The sharp recovery in automotive production and other consumer durable goods industries had a favourable impact on the demand for sheet and strip. By contrast, further declines in business capital spending continued to depress the demand for plate and other products used in these sectors. Though volumes in most product classifications and consuming industries showed some improvement (plate and the pipe and tube industry were a notable exception), total demand still remained far below its 1981 levels. Thus, in round figures, total 1983 mill shipments of 10 million metric tonnes, notwithstanding the improvement in the economy, were still 2 million metric tonnes or one-sixth below the 12 million metric tonnes level of 1981.

2.3.2 Competitive Position

Except for a short period between 1973 and 1975, the value of Ontario exports of iron and steel has constantly exceeded the value of imports.

EXHIBIT 2

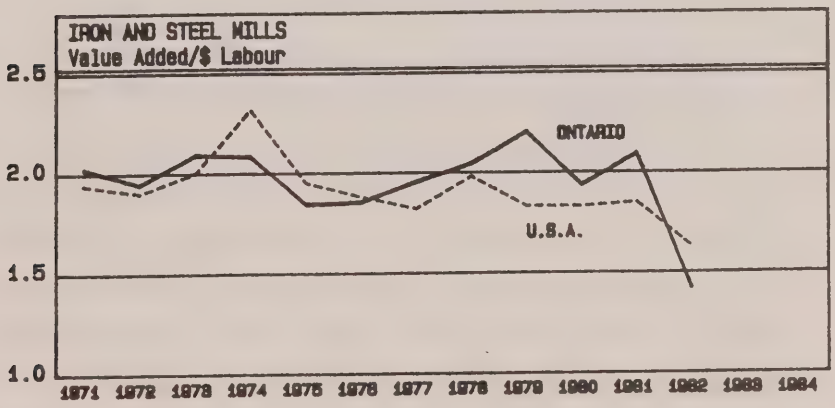


Ontario's normalized trade balance (exports minus imports divided by exports plus imports) has been positive since 1976, but it has fluctuated throughout the period. Imports doubled from 1980 to 1981, but then declined dramatically in 1982.

Except for the years 1979 and 1981, imports were approximately twice the value of exports for the period between 1977 and 1983. The Iron and Steel Industry has a strong domestic base in Ontario, in that there is no significant dependence on imports. Should demand for these products increase in the future, there is enough unused capacity to accommodate volume increases.

The performance of Ontario's Iron and Steel Industry can be compared to the counterpart industry in the United States based on an analysis of value added per dollar of labour. Exhibit 3 below indicates that in Ontario, value added per dollar of labour exceeded that in the U.S. except for the period 1974 to 1976 and in 1982.

EXHIBIT 3



In the late 1970's and early 1980's the United States value added per dollar of labour fluctuated between 83 and 97 percent of the Ontario figure. In 1982, that trend was reversed when value added per dollar of labour in Ontario experienced a decline of 32.1 percent.

2.3.3 Capital Investment

Capital investment statistics are only available for Canada as a whole for SIC 291; however, in 1982 Ontario based manufacturers of iron and steel products accounted for 82.1 percent of Canadian shipments of these products.

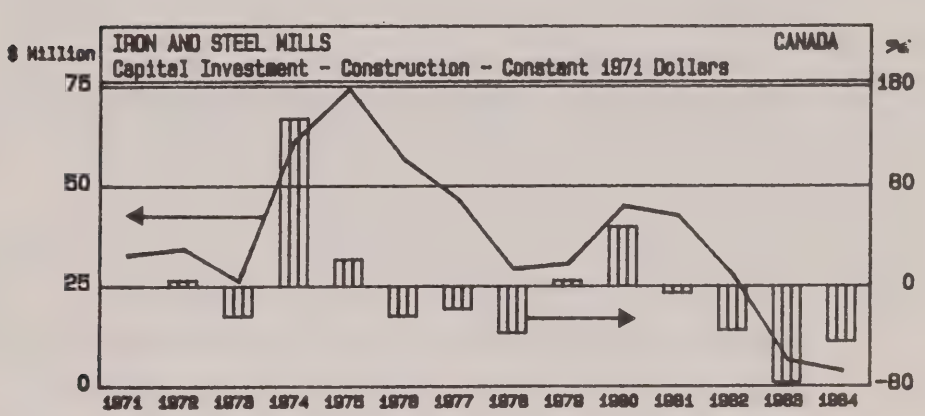
In current dollars, total capital spending by the Iron and Steel Industry increased from $201.6 million in 1971 to $710.0 in 1981 which was the peak for the entire period. From 1982 to 1984, capital spending plummeted from 1981 levels to a low point of $198.3 million in 1983. A slight improvement is expected in 1984 to $226.5 million, though it is still below the 1981 level.

In constant terms this translates to levels of $201.6 million in 1971 and $292.3 million in 1981. In 1971 constant dollars, 1975 was the year of highest capital investment at $384.1 million dollars. Compared to 1971, real capital investment in 1984 is expected to be only $79.7 million.

The pattern of capital spending in constant 1971 dollars in the Iron and Steel Industry was that of rapid build-up and sudden decline. Before the high point in the early 1970's was reached ($384.1 million in constant dollars in 1975), there was rapid growth in the preceding years with increase of 49.8 percent in 1974 and 16.1 percent in 1975. This was followed by rapid declines of 31.8 percent in 1976, 7.6 in 1977 and another drop of 28.6 percent in 1978. In the next cycle this build-up was also intensive as capital spending jumped 42.7 percent in 1980 and experienced another increase of 8.9 percent in 1981. The downward side of the cycle was even steeper as the following two years showed respective declines of 45.9 and 53.7 percent.

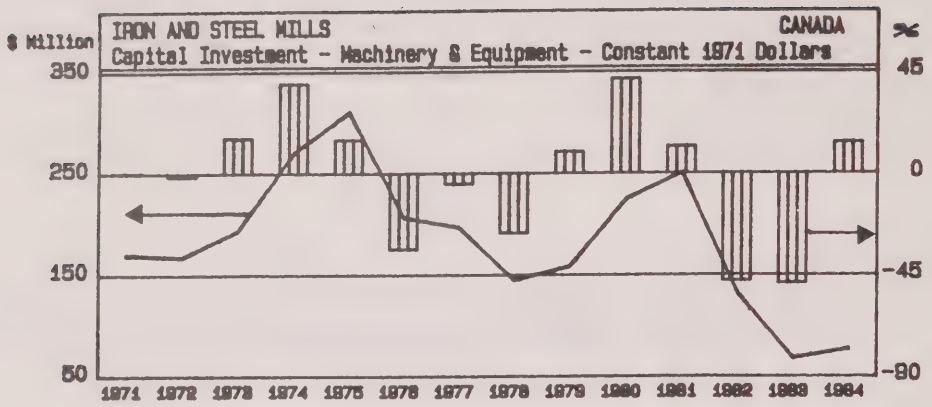
The mix between construction and machinery and equipment components of capital spending leans heavily on the side of machinery and equipment. This was continually the driving force behind expenditures in the 1971 to 1984 period.

EXHIBIT 4



Capital spending in constant 1971 dollars on construction reached an all time peak of $74.2 million in 1975. For several years afterwards it experienced a steady decline, reaching a trough in 1978 at less than half of the 1975 value. It took a dramatic upward leap between 1979 and 1980, resulting in a 47.4 percent increase in real terms. This recovery ended in 1980, when the level of capital investment on construction reached $44.8 million. From then on it was downhill all the way, with four successive declines of 5.6, 35.2, 77.0 and 44.4 percent. This equates to a dismal level of construction activity in 1984, of $3.5 million in constant dollars. In current terms this is $10.4 million. This is the lowest value for capital investment on construction in the whole time frame under consideration in both constant and current dollar terms.

EXHIBIT 5



Machinery and equipment investment shows much the same pattern of peaks and valleys as construction and total spending, though some of its fluctuations seem more moderate. And while construction spending is still experiencing rather precipitious declines, investment in machinery and equipment is expected to show a positive constant dollar increase of 13.7 percent in 1984. In real terms, spending on machinery and equipment improved to $76.2 million in 1984. This compares to $250.0 million 1971 constant dollars in 1981 and $169.0 million in 1971.

Excess capacity has always plagued the Iron and Steel Industry, with the average capacity utilization being 82.1 percent between 1971 and 1981. Recently the rate has been below 60 percent. This is the main reason why construction spending is not the major factor in capital investment and why construction spending is at such low levels at the present time.

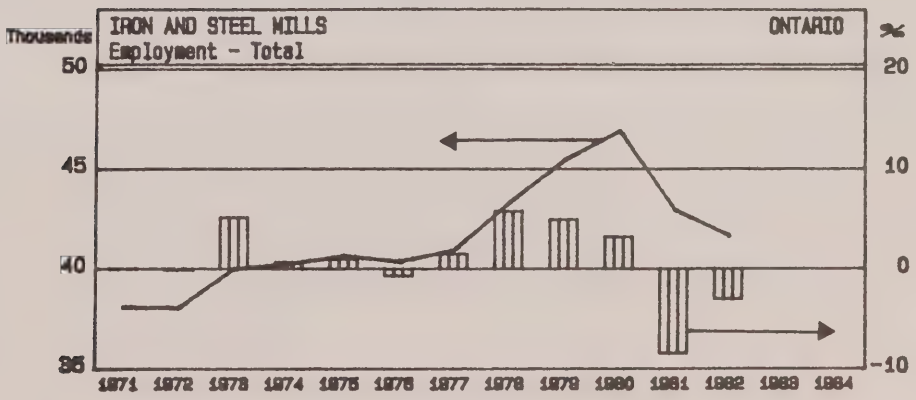
2.3.4 Employment

The discussion of employment includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

In this section of the report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the census of manufacturing industries conducted by Statistics Canada annually. This data is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

EXHIBIT 6

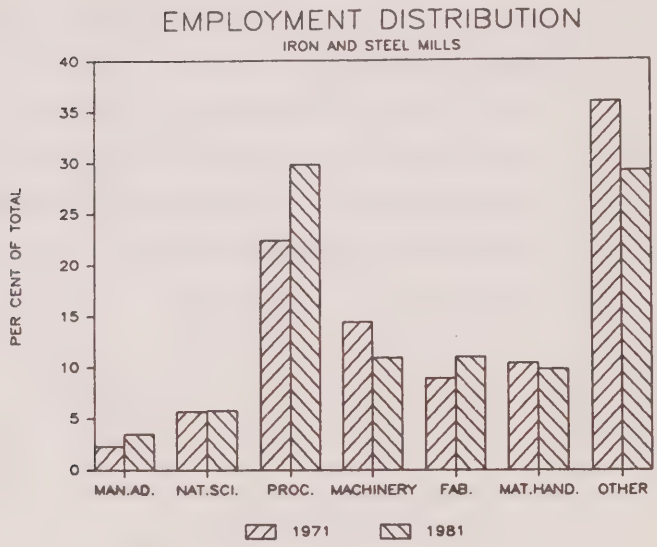


Total employment in the Iron and Steel Industry in Ontario grew at an average annual rate of 1.2 percent over the 1971 to 1981 period. Employment growth was rather flat between 1974 and 1977, at 0.6 percent a year, resulting in a net increase of 699 jobs.

Employment levels picked up after 1977, peaking in 1980 at 46,879 employees. The largest decline since 1971 was experienced in 1981 when the employment level dropped 8.5 percent. In 1982 there were 41,603 jobs as compared to 38,037 in 1971.

- Occupational Changes

EXHIBIT 7



The census data for Ontario show that average employment growth in the Iron and Steel Industry was only 2.4 percent per year from 1971 to 1981. Table D.10 indicates that one of the smallest occupational groups, Managerial and Administrative occupations (3.5 percent of total employment in 1981) had the highest average annual growth rate of 6.7 percent. At the other extreme, Machining and Related occupations (10.9 percent of total employment in 1981) experienced an average annual decline in employment of 0.4 percent. The proportionately largest occupational group (29.8 percent of total employment in 1981) was Processing, which experienced an average annual growth rate of 5.3 percent from

1971 to 1981. Other occupational groups such as Fabricating, Assembling and Repair also managed to grow faster than the industry average at 4.5 percent per year as compared to average annual growth of 2.4 percent for the industry. Natural Sciences, Engineering and Mathematics occupations managed to stay barely abreast of the industry growth rate, at 2.7 percent. Employment in Material Handling and Related occupations grew at an average annual rate of 1.7 percent, becoming proportionately less significant than in 1971. The Other occupational group, over a third of which was made up of clerical workers in 1981, also declined proportionately.

In the Processing group only two categories at the more detailed occupational level showed declines in employment (metal rolling and moulding, coremaking and metal casting). The most significant category was metal processing and related occupations which experienced an average annual increase in employment of 8.7 percent and accounted for 4,975 employees in 1981.

The highest average annual growth rate in this group was 19.4 percent experienced in the jobs related to crushing and grinding mineral ores, but this was a fairly small category (1.6 percent) within processing occupations in 1981.

Most Machining Related occupations experienced a decline in employment levels. Only three employment categories at the detailed level exhibited any positive trends, and together they accounted for 48 percent of the Machining and Related group.

All the occupational groups in Management and Administration exhibited positive growth rates in the 1971 to 1981 time period. Production managers

had the highest average annual growth rate at 18.6 percent and were also the largest category within their group, accounting for 21.7 of Management Administrative and Related positions in 1981. Accountants and financial officers had the worst record in this group with an average annual growth rate of 1.2 percent.

While physical sciences technologists and civil engineers experienced average annual declines of 1.0 and 0.4 respectively, mechanical and electrical engineers enjoyed average annual employment growth of 7.6 and 9.1 percent. The most significant group in this area, with 595 employees in 1981 - architectural and engineering technologists and technicians - also had a relatively high average annual growth rate of 6.6 percent.

Material Handling and Related occupations were approximately 10 percent of total industry employment in 1981. The largest category at the more detailed occupational level (68.9 percent) was hoisting, n.e.c. This group had an average annual growth rate of 2.3 percent, just slightly below the industry average.

Table D.11 indicates that women are not a significant factor in the occupations being discussed, even though their proportion of total employment slightly increased from the 1971 level. In 1981, they only accounted for 7.1 percent of total employment in the Iron and Steel Industry.

Most women were employed in Processing jobs, accounting for just under 10 percent of all women employed in the industry. But in this category they only accounted for 2.3 percent of all employees. The

highest proportion of women was in Managerial positions, 8.7 percent of total employment. Although women increased their representation in most of these occupations, they really have not made a significant impact on any of them.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this study presents the survey results which discuss the firms' surveyed opinions as to future trends in technological adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Iron and Steel Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The large manufacturing scale of iron and steel plants has given this sector the opportunity to adopt a broad range of the new technologies. A significant contribution to the spread of new technology has been made by the practice of sharing information on new technology with other steel manufacturers.

The industry has already put in place many of the new systems in the market that aid in manufacturing planning and control. Firms are also making widespread use of some telecommunications technologies. Further significant additions will be made in the next five years in both these areas and also in design and manufacturing process technologies.

The pace of technological change will continue strongly through the early 1990's for all the technologies. Table 2 summarizes the percentage of firms who have adopted new technologies before 1985, or will by 1990, or will after 1990 and before 1995. The following provides observations on the survey findings.

Results of Question 3

TABLE 2: IRON AND STEEL MILLS

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985	1985-1990	1990-1995
	Large	Large	Large
1. DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	0	100	-
Computer-Aided Engineering (CAE)	67	-	33
CAD/CAM Integration	0	-	67
Other	33	33	33
2. MANUFACTURING PLANNING AND CONTROL TECHNOLOGIES			
Computerized Financial Systems	100	33	33
Computerized Order Entry/Inventory Control	100	33	33
Computer-Aided Process Planning	100	33	33
Manufacturing Resource Planning Systems (MRP)	0	100	33
Automated Shop Floor Data Collection	67	33	33
Computerized Decision Support Systems	33	67	33
Computerized Maintenance Planning and Control	67	100	33
3. MANUFACTURING PROCESS TECHNOLOGIES			
Ladle Metallurgy (Electronic Ladle)	0	100	33
Continuous Casting (Molten to "Near Net" Shapes)	67	33	33
Automatic Casting/Molding	0	33	-
Numerically Controlled Machines (NC)	67	67	33
Computer Controlled CN Machines (CNC)	0	100	33
CAD Directed CNC	0	33	33
Computerized Process Control Systems	67	67	33
Computer-Aided Inspection and Testing	67	100	33
Robotic Applications	0	-	67
Computer Integrated Manufacturing (CIM)	0	33	-
4. MATERIALS HANDLING TECHNOLOGIES			
Automatic Bulk Handlers/Feeder Systems	67	33	33
Automated Conveyor/Vehicle Systems	67	33	33
Automated Storage and Retrieval	0	33	67
Computer Controlled Conveyor/Vehicles	0	-	33
Automated Warehouse	33	33	33
5. TELECOMMUNICATIONS TECHNOLOGIES			
Facsimile (FAX) Link: HO/Plant(s)	100	33	33
Computer Link: HO/Plant(s)	100	33	33
Computer Link: Suppliers/Customers	33	100	33
Other	0	33	-
6. OTHER TECHNOLOGIES	33	67	33

(1) '0' used prior to 1985 to indicate have not adopted.
'_'used for periods 1985-1990 and 1990-1995 to indicate respondents, at time of survey, are not planning to adopt this technology or 'don`t know'.
Responses are not mutually exclusive.

3.1.1 Design Technologies

The industry has already widely adopted computers in engineering applications. Computer-aided design is planned for adoption during the next five years by all firms surveyed. By 1995, 67 percent of the industry will have these systems in place and integrated with each other.

3.1.2 Manufacturing Planning and Control Technologies

Computers have been put to use in finance and plant management tasks by the entire industry. By doing so, firms have been able to keep in closer touch with their customers' demands. The firms have also improved inventory control methods which was made important by the recession and high interest rates.

The coming decade will see a continued spread in computer use within the plant for decision support, maintenance planning and control and manufacturing resource planning. By 1995 these technologies will be widely adopted in the industry.

3.1.3 Manufacturing Process Technologies

This set of new technologies has been introduced in a limited fashion in this industry. Continuous casting, numerically controlled machines and computer-based process control and inspection and testing have been adopted by 67 percent of the industry. The 1985-1990 period promises significant development, with the industry expecting to bring on stream new ladle metallurgy developments and marry computers to their numerically controlled machinery.

The industry will continue to adopt new technology in all these categories throughout the early 1990's. It is expected that about 67 percent of the industry will have introduced robotics by 1995.

3.1.4 Materials Handling Technologies

The industry has adopted automated bulk handling and conveyor systems on a broad basis. Up to now, 67 percent of the industry has them in place. New systems will continue to be added in the coming decade. Other new handling systems may see limited future use, especially automated storage and retrieval systems, which 67 percent of the industry expects to have in place by 1995.

3.1.5 Telecommunications Technologies

The industry generally has taken advantage of telecommunications innovation to link their head offices and plants. These systems will continue to be upgraded in the coming decade. The 1985-1990 period will feature the forging of computer links between these firms and their suppliers and customers. These developments will augment the computerized order entry and inventory control systems already in place.

3.2 Forces Driving the Need to Adopt New Technology

A few key forces are driving the industry to adopt new technologies. Table 3, summarizes the results of the survey. The most important factors are:

- Increased competition. These pressures include the foreign competition from low cost foreign producers (frequently developing countries), the slow growing domestic market and the changing end use substitution.

Results of Question 4

TABLE 3: IRON AND STEEL MILLS SIC 291

Most Important Factors Driving Need to Adopt New Technologies

Percent of Firms by Employment Size

Factor		Total Firms
COMPETITIVE PRESSURES	First	33
	Second	33
	Third (1)	0
	Weighted Importance	1.7
STRATEGIC	First	0
	Second	0
	Third	33
	Weighted Importance	0.3
INCREASE PRODUCTIVITY	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
INCREASE QUALITY	First	0
	Second	33
	Third	0
	Weighted Importance	0.7
INCREASE MANAGEMENT INFORMATION	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
LOWER COSTS	First	0
	Second	33
	Third	33
	Weighted Importance	1.0
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0
	Second	0
	Third	33
	Weighted Importance	0.3
INCREASE QUALITY	First	0
	Second	33
	Third	0
	Weighted Importance	0.7

NOTE: Only large firms responded.
(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

- Increased productivity and management information. The industry recognizes the need to gain greater control of the manufacturing operations as well as the need to keep in closer touch with customers. Product quality improvements are cited as an important adjunct to these factors.

- Cost control is also cited as a factor driving the industry to adopt new technologies.

3.3 Factors that Could Slow the Rate of Technology Adoption

The survey participants identified the single most important factor that could slow the rate of technology adoption as the lack of skills or knowledge of how to adopt potentially useful technologies to their firm.

The second most commonly cited factor that could slow adoption of technology is the cost of financing its acquisition. The ability to modernize plant and equipment has been limited in the past by slim profits and the high cost of external funding. Table 4, summarizes the results of the survey.

Results of Question 5

TABLE 4: IRON AND STEEL MILLS SIC 291

Most Important Factors that Could Slow the Rate of New Technology Adoption

Percent of Firms by Employment Size

Factor		Total Firms
ABILITY TO FINANCE	First	33
	Second	33
	Third (1)	0
	Weighted Importance	1.7
COST OF NEW TECHNOLOGY	First	0
	Second	0
	Third	67
	Weighted Importance	0.7
COMPETITIVE ENVIRONMENT	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	33
	Second	67
	Third	0
	Weighted Importance	2.3

NOTE: Only large firms responded.
(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the Iron and Steel Industry in terms of aggregate output (i.e., manufacturing shipments in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Iron and steel manufacturing output has rebounded strongly from the recession with the value of constant dollar shipments rising by 13.5 percent in 1984. However, actual levels of output are still below the pre-recession peak. In 1985, the respondents are expecting moderate growth of 3.5 percent. In the longer term the industry expects constant dollar shipments to rise at about 2 percent per annum to 1995. The survey results are summarized in Table 5. These views are similar to the expectations of the industry experts consulted.

4.2 Investment Patterns

The firm respondents indicate that the level of investment in the industry is expected to be in excess of $2 billion during the period 1985 to 1990. Of that amount, 75 to 80 percent will take the form of machinery and equipment investment. About 50 percent of plant and equipment investment expenditure will be related to new technology. The survey results do not allow us to comment on expected investment levels for the 1990-1995 period. Based on the expert consultation it can be expected that 50 percent of capital investment will be related to new technology and will occur in machinery and equipment.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The industry appears to require a return on investment of about

Results of Question 1

TABLE 5: IRON AND STEEL MILLS — SIC 291

Manufacturing Shipments in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

Firms by Employment Size	Estimated 1982-1983	Estimated 1983-1984	Estimated 1984-1985	Expected 1985-1990	Expected 1990-1995
Total Firms	7.0	13.5	3.5	2.5	2.0

NOTE: Only large firms responded.
(1) Rounded to closest 0.5%.

Results of Question 17e

TABLE 6: IRON AND STEEL MILLS

SIC 291

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period		Return on Investment		All Others		
	% of Firms Using Pay-Back	Average Period (Years)	% of Firms Using ROI	Average Rate (%)	Percent of Firms Using: Discounted Cash Flow	Strategic	Others
Total Firms	67	3	100	8.5	0	100	67

Answers not mutually exclusive.

Results of Question 17f

TABLE 7: IRON AND STEEL MILLS

SIC 291

Source of Funds for New Technology Spending

Employment Size	Internal Funds	External Funds
	Percent	Percent
Total Firms	77	23

9 percent to justify the application of funds. Likewise, those who use a pay-back criterion (67 percent of the industry) look for investment to pay for itself within three years (Table 6).

However, industry executives stress that such formal criteria are flexible. The need to improve product quality and maintain "competitive position" in individual markets may push firms into adopting new technology whose expected returns do not meet these criteria or require a longer payback period.

4.2.2 Source of New Capital Spending

The industry expects to finance 77 percent of the anticipated investment programs from internal funds and 23 percent from external funds.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

Firms in the Iron and Steel Industry identified the most important factor affecting their employment level in Ontario as the ability to compete. The next most important factors are availability of necessary skills, industry-wide growth and Canada's foreign exchange rate and/or competitive position. Another contributing factor is introduction of new technology. See Table 8.

The survey responses indicated that employment in the Iron and Steel Industry largely depends on firm and industry growth. Another consideration is continued access to

markets, especially the United States market where the appreciation of the United States dollar against other currencies has strengthened the steel lobby's demand for trade protection.

4.3.2 Employment Outlook

The firms surveyed indicate that the Iron and Steel Industry expects employment to increase by 2.5 percent in 1985 after declining at an average annual rate of 7.0 percent from 1981 to 1984.

For the 1985-1990 period, the firms anticipate experiencing a 1 percent annual average increase in employment levels. For the period 1990-1995, they expect employment to average 0.5 percent growth per annum (see Table 9).

4.3.3 Trends in Part-Time Work

Part-time employment is currently insignificant in the iron and steel industry. Survey respondents expect that in the 1985-1995 period part-time employment will increase slightly, although it will remain a small proportion of total employment. An estimated 1 percent of total employees are expected to be part-time by 1990 and a further rise to 2 percent is expected by 1995.

4.4 Changes in Occupational Structure

Table 10 shows trends in firms' occupational structure in the Iron and Steel Industry from 1981 to 1995. Each major occupational group is expressed as a percent of total industry employment, by year. Trends over time for minor occupational

Results of Question 11a,b,c

TABLE 8: IRON AND STEEL MILLS SIC 291

Most Important Factors Affecting The Firms' Employment in Ontario

Percent of Firms by Employment Size

Factor		Total Firms
INTRODUCTION OF NEW TECHNOLOGY	First	0
	Second	33
	Third	0
	Weighted Importance (1)	0.7
AVAILABILITY OF NECESSARY SKILLS	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
ABILITY TO COMPETE	First	0
	Second	67
	Third	0
	Weighted Importance	1.3
INDUSTRY-WIDE GROWTH	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	33
	Second	0
	Third	0
	Weighted Importance	1.0
ALL OTHERS	First	0
	Second	0
	Third	100
	Weighted Importance	1.0

NOTE: Only large firms responded.
(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 9: IRON AND STEEL MILLS — SIC 291

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Total Firms	-7.5	2.5	1.0	0.5

NOTE: Only large firms responded.
(1) Rounded to closest 0.5%.

Results of Question 12

TABLE 10: IRON AND STEEL MILLS SIC 291

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	12.2	12.6	12.3	12.9	13.5
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	4.3	4.6	5.2	6.7	8.2
• Engineers		0	0	+	+
• Engineering Technicians and Technologists		0	+	+	+
• Systems Analysts and Computer Programmers		0	+	+	+
• All Other Science and Mathematics (not listed above)		0	0	+	+
PROCESSING	17.4	20.3	20.3	18.7	17.8
MACHINING	13.4	16.1	16.2	17.8	19.8
• Machinist and Machine Tool Setting-Up		+	0	+	+
• Machine-Tool Operators		0	0	0	0
• Welding/Soldering		0	0	0	0
• All Other Machining (not listed above)		0	0	0	0
FABRICATING, ASSEMBLING AND REPAIRING	10.2	8.1	7.9	8.7	9.7
• Electrical Equipment Installing and Repairing		-	0	+	+
• Industrial Machinery Mechanics and Repairmen		+	0	+	+
• All Other Fabricating, Assembling and Repairing (not listed above)		-	-	+	+
MATERIALS HANDLING AND RELATED	10.7	11.8	11.7	11.5	11.8
ALL OTHER OCCUPATIONS	31.8	26.5	26.4	23.8	19.2
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 remain the same

groups are expressed as: +, increasing share of total employment; -, decreasing share of total employment and o, no change in share of industry employment.

The CCDO of occupations was used to classify and describe the occupations outlined in Table 10. Survey respondents were provided with a detailed description of each occupation; however, in some cases, differences in interpretation of the classifications occurred.

Table 10 suggests:

- a modest increase in Managerial Administrative and Related occupations from 12.3 percent of total employment in 1985 to 13.5 percent of total employment in 1995;

- a significant increase in Natural Sciences, Engineering and Mathematics occupations. These occupations represented 4.3 percent of total employment in 1981 and currently account for 5.2 percent of total employment in 1985. By 1995, their share of the total is expected to increase to 8.2 percent, nearly twice the 1981 proportion.

- some declines in Processing occupations from 20.3 percent of total employment in 1985 to 17.8 percent in 1995;

- increases in Machining occupations' share of total employment from 13.4 percent in 1981 and 16.2 percent in 1985 to 19.8 percent by 1995. Although machinists and machine tool setting-up occupations will experience increases in their share of employment, other machining occupations are expected to experience no change in their share;

- modest increases in all Fabricating, Assembling and Repairing occupations' share of total employment. The occupational category, as a whole, represented 10.2 percent

of total employment in 1981 and represents 7.9 percent today in 1985. By 1995, respondents anticipate that these occupations will account for 9.7 percent of total employment;

- little change in Materials Handling and Related occupations' share. Share of total employment is expected to remain between 11.5 and 11.8 percent over the decade ahead.

To summarize, Table 10 indicates that the following major occupational categories will experience increases in their share of total employment from 1985 to 1995:

- Managerial, Administrative and Related,
- Natural Sciences, Engineering and Mathematics,
- Machining, and
- Fabricating, Assembling and Repairing.

Processing is the only major occupational category to experience a decrease in its share of total employment. Materials Handling and Related's share remains flat over the period.

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job content.

5.1 Effects on Occupations

Table 11 summarizes firms' views on how technology will affect their occupational requirements. The table indicates that future shortages of supply will occur for occupational groups expected to increase their share of total employment by 1995. These groups include:

- Managerial, Administrative and Related occupations,
- all the Natural Sciences, Engineering and Mathematics occupations specified in the questionnaire,
- some Machining occupations, including machinists and machine tool setting-up and welding/soldering occupations, and
- within Fabricating, Assembling and Repairing, the electrical equipment installing and repairing and industry machinery mechanics and repairmen occupations.

Occupations where an oversupply is expected to occur are:

- Processing, and
- Materials Handling and Related.

These occupations were also expected to decrease or maintain their share of employment over the decade ahead.

Results of Question 6

TABLE 11: IRON AND STEEL MILLS SIC 291

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	0	67	33
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	0	100	0
• Engineering Technicians and Technologists	0	100	0
• Systems Analysts and Computer Programmers	0	100	0
PROCESSING	67	0	33
MACHINING			
• Machinist and Machine Tool Setting-Up	0	67	33
• Machine-Tool Operators	33	33	33
• Welding/Soldering	0	67	33
FABRICATING, ASSEMBLING AND REPAIRING			
• Electrical Equipment Installing and Repairing	0	67	33
• Industry Machinery Mechanics and Repairmen	0	67	33
MATERIALS HANDLING AND RELATED	67	0	33
OTHER	0	0	100

Respondents were divided in their opinions as to whether Machine-Tool Operators will be in an over- or an under-supply situation.

5.2 Likely Steps to Deal with Skills Oversupply

Attrition was the most commonly cited step to deal with an oversupply of skills in the Processing, machine-tool operators and Materials Handling and Related occupations in the Iron and Steel Industry. Other steps in order of importance were:

- lateral transfers, and
- early retirement.

The ranking of these steps was consistent across all the above occupations (see Table 12).

5.3 Likely Steps to Deal with Skills Shortages

The most commonly cited steps for dealing with shortages of skills which may develop are recruitment of employees and upgrading the skills of current employees. See Table 13.

In the Managerial, Administrative and Related and the Natural Sciences, Engineering and Mathematics occupations, recruiting of employees was the most commonly cited step to deal with shortages. Upgrading of current employees and retraining were also cited as important.

In all the Machining and Fabricating, Assembling and Repairing occupations, upgrading of current employees was the most commonly cited step to deal with shortages. Recruiting and retraining were the second and third most commonly cited steps,

SIC 291

Results of Question 7

TABLE 12: IRON AND STEEL MILLS

Steps Firms Will Likely Take to Deal with OVERSUPPLY of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
PROCESSING	Attrition	Lateral Transfers	Early Retirement
MACHINING			
• Machinist and Machine Tool Setting-Up • Machine-Tool Operators • Welding/Soldering	Attrition	Lateral Transfers	(1)
MATERIALS HANDLING AND RELATED	Attrition	Lateral Transfers	Early Retirement

(1) Only two steps mentioned.

Results of Question 8

TABLE 13: IRON AND STEEL MILLS SIC 291

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Recruit	Upgrade	Retrain
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Recruit	Retrain	(1)
• Engineering Tecnicians and Technologists	Recruit	Retrain	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Retrain	Upgrade
MACHINING			
• Machinist and Machine Tool Setting-Up	Upgrade	Recruit	Retrain
• Machine-Tool Operators	Upgrade	Retrain	(1)
• Welding/Soldering	Upgrade	Recruit	Retrain
FABRICATING, ASSEMBLING AND REPAIRING			
• Electrical Equipment Installing and Repairing	Upgrade	Recruit	Retrain
• Industrial Machinery Mechanics and Repairmen	Upgrade	Recruit	Retrain

(1) Only two steps mentioned.

respectively, across all the minor occupations except machine-tool operators, where retraining alone was cited as important.

In summary, Table 13 indicates that recruitment will be the most important source of candidates for occupations requiring an advanced education, while upgrading will be the primary source of candidates for other positions.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on selected occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

Respondents indicated that they expect skill requirements to increase across most occupations. However, only 67 percent of respondents expect increases in skill requirements for the following occupations:

- machine-tool operators, and

- welding/soldering.

In the Materials Handling and Related occupations, 67 percent of respondents expected skill requirements to remain about the same, with 33 percent anticipating an increase.

Respondents expect that more, or about the same amount of, time will be required to achieve proficiency in most occupations; however, respondents were more divided in their opinions on this question than on the question of skill requirements.

Similarly, respondents expect that more, or about the same amount of, knowledge will be required of firm's operations; however, opinions were more divided here once again than in the question of skill requirements (see Table 14).

5.5 Training Costs and New Technology

Iron and steel industry respondents estimate that they currently spend about 2 percent of their total labour costs on training. This proportion is expected to increase to 2.5 percent by 1995. Training costs related to new technology are expected to increase from 60 percent today, to 75 percent by 1990. By 1995, training costs related to new technology will continue to represent 75 percent of total training costs compared to a peak of 80 percent in 1984.

Results of Question 9

TABLE 14: IRON AND STEEL MILLS

Impact of Technology on Skill Levels and Job Content

(1)

Occupations	Percent of Firms								
	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	100	0	0	67	33	0	100	0	0
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	100	0	0	33	33	33	100	0	0
• Engineering Technicians and Technologists	100	0	0	67	33	0	67	0	33
• Systems Analysts and Computer Programmers	100	0	0	33	0	67	67	0	33
PROCESSING	100	0	0	67	0	33	67	0	33
MACHINING									
• Machinist and Machine Tool Setting-Up	100	0	0	67	0	33	33	0	67
• Machine-Tool Operators	67	0	33	33	0	67	33	0	67
• Welding/Soldering	67	0	33	33	0	67	33	0	67
FABRICATING, ASSEMBLING AND REPAIRING									
• Electrical Equipment Installing and Repairing	100	0	0	67	0	33	67	0	33
• Industrial Machinery Mechanics and Repairmen	100	0	0	67	0	33	67	0	33
MATERIALS HANDLING AND RELATED	33	0	67	33	0	67	33	0	67

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

6.0 Labour Relations Environment

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

In 1982, there were 26,882 unionized employees in the Iron and Steel Industry in Ontario, representing 64.6 percent of the total workforce of 41,603 persons. Union membership is predominantly with the United Steelworkers of America (Table 15).

6.2 Trends in Unionization

In the Iron and Steel Industry, 33 percent of firms surveyed have union representation. Firms with unions currently have 78 percent of their work force unionized. By 1990, firms with unions are expected to have only 75 percent of their work force unionized and by 1995 the ratio is expected to decline to 70 percent. Firms therefore expect a modest decline in the percentage of unionization within firms which already have a union.

6.3 Technology Change Clauses

Survey respondents indicated that 80 percent of their union contracts contain technology change clauses. These clauses included:

- Notice/disclosure,
- Consultation/participation,
- Job security, and
- Seniority.

TABLE 15

INDUSTRIAL RELATIONS: IRON AND STEEL INDUSTRY

UNION	NUMBER OF MEMBERS	MAJOR EMPLOYER*	LOCATION	TECHNOLOGICAL CHANGE CLAUSE IN AGREEMENT
UNITED STEELWORKERS	12,700	Stelco Inc. - Hilton Works	Hamilton	Advance Notice, Consultation, Training, Income Protection, Automation Fund, Transfer Arrangements
	805	Lake Erie Works	Nanticoke	
	111	- Canadian Drawn Works	Hamilton	N.A.
	7,500	Algoma Steel Corporation Limited - Steel Plant	Sault Ste. Marie	Advance Notice, Consultation, Transfer Arrangements, Other Consultation, Training,
	592	Tube Division	Sault Ste. Marie	Transfer Arrangements Advance Notice, Consultation,
	600	Burlington Steel, Division of Slater Steel	Hamilton	Training, Income Protection, Automation Fund, Transfer Arrangements Advance Notice, Consultation,
	580	Lake Ontario Steel Co. Ltd.	Whitby	Training, Income Protection, Automation Fund, Transfer Arrangements
	250	Ivaco Inc., Rolling Mills Division	L'Orignal	None
	158	Stanley Precision	Hamilton	N.A.
	148	Neelon Casting	Sudbury	N.A.
	143	Atlas Steels, Division of Rio Algom Mines	Welland	N.A.
	140	Welmet Industries	Welland	N.A.
CANADIAN STEELWORKERS	1,500	Atlas Steels Co.	Welland	Advance Notice, Consultation, Training
UNITED ELECTRICAL WORKERS	395	Union Carbide Canada Limited	Welland	None
UNITED TRANSPORTATION WORKERS	203	Algoma Steel Corporation Limited	Sault Ste. Marie	None
BRICKLAYERS INTERNATIONAL	120	Stelco Inc. - Hilton Works	Hamilton	N.A.
	113	Union Drawn Steel Co.	Hamilton	N.A.
	111	Canada Alloy Castings	Kitchener	N.A.
	106	Courtice Steel	Bowmanville	N.A.

* Employer with a union agreement covering 100 employees or more. The union agreements above represent 98 percent of unionized employees.

N.A. Information not available on Ontario Ministry of Labour database.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

6.4 Management's Perception of their Union's Position on New Technology

Management respondents reported that union leadership is concerned about the role that their union plays in the process of technological change. Industry executives believe that union leaders clearly recognize the need for new technology to maintain markets and improve product quality. Some concern is evident about preventing further membership reductions after the large losses in the early 1980's. However, management believes that union leadership is more concerned with ensuring access to proper training for the new technology than with absolute membership levels either at the plant level or by occupational group.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Survey respondents indicated that no formal mechanisms exist for setting production and sales targets in the Iron and Steel Industry above the working group level, the lowest possible level of agreement. Setting such targets at higher levels of the organization is regarded by executives as the responsibility of management.

By contrast, there are formal agreements for improving productivity and quality in all firms responding to our survey, regardless of the degree of union representation. Most firms (67 percent of the industry) also have a formal means of gaining workers' participation in adopting new technology.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked to what extent and how should management involve workers in decisions regarding the adoption of new technologies.

The Iron and Steel Industry is united in expressing the need for worker involvement in the process of adopting new technology; however, views differ as to the proper extent and nature of involvement. Even those who insist that management must control the decision to introduce new technology recognize the advantages of including workers in the planning and installing stages. Others believe that workers are in a position to evaluate the potential benefits of technological change, helping to draw attention to areas of largest potential gain.

Firms are also aware of the need to properly train personnel on new machinery and controls. They noted that a strong training program pays dividends in productivity and in worker acceptance of new technology.

Unions are dissatisfied with the extent of union involvement in the process of technological change to date. Firms, in their view, should be more willing to reveal their plans or their options regarding technological change than they have been in the past. Openness is a major factor in helping to build trust and foster participation in the process of technological change. Without an open exchange of information, union leaders may be forced by membership pressure into resisting change in order to preserve existing jobs. The leadership feels that resistance to change is ultimately doomed because successful resistance will result in declining productivity and shipments in the long run.

7.0 Planning for Technological Change

This chapter reports survey results regarding questions related to planning for technological change. A summary of these results appears in Table 16.

The survey indicates that the entire industry makes use of strategic planning techniques. Virtually all firms have a capital investment plan which explicitly deals with the adoption of new technology. Such plans on average look forward about five years. However, a wide range of dates was recorded, from 1985 to the 1990-1995 period.

Human resource planning is less well established than strategic or capital investment planning for new technology. An estimated 67 percent of the industry plans formally to meet its future human resource needs, out to 1989 on average. (A narrower range of views exists in this area than in capital investment planning.)

The views expressed by the survey respondents are at variance with the industry's public image of "industrial dinosaur". Table 16 suggests that the industry is forward looking and is fairly well integrated in its human resource and capital investment plans. Previous chapters reinforce this impression by showing to what degree this "smokestack industry" is using new technology to respond to the problems of the recession and foreign competition.

Results of Question 18

TABLE 16: IRON AND STEEL MILLS

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Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Total Firms	100	67	5 Years	100	5 Years	3.7

NOTE: Only large firms responded.
(1) Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I to III.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Iron and Steel Industry	Part I
B	Questionnaire	Part I
	Responses by Question	Part III
C	Reliability of the Sample	Part I
D	Historical Tables	Part II

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE IRON AND STEEL INDUSTRY

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE IRON AND STEEL INDUSTRY

Size Categories Used to Stratify the Sample Frame		Size Categories Used to Weight and Report Survey Results	
Number of Employees			Number of Employees
20 - 49			
50 - 99		Small	20 - 99
100 - 199			
200 - 499		Medium	100 - 499
500 - 999			
1000 - 1499			
1500 - 2499		Large	500 or more
2500 - 4999			
5000 or more			

APPENDIX B

QUESTIONNAIRE

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

IRON AND STEEL INDUSTRY
(SIC 291)
QUESTIONNAIRE

Currie, Coopers & Lybrand
Management Consultants

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their firm before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

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You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your firm's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the firm's future direction.

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EXHIBIT A

SELECTED OCCUPATIONS: IRON & STEEL, SIC 291

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support functions such as personnel officers, financial officers).

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Engineers.
Engineering Technicians & Technologists.
Systems Analysts & Computer Programmers.

PROCESSING (includes materials processing occupations such as in metal processing: refining, smelting, heat treating, rolling, moulding, casting, extruding, plating, testing and inspecting).

MACHINING

Machinist & Machine-Tool Setting-Up.
Machine-Tool Operators.
Welding/Soldering.

FABRICATING, ASSEMBLING & REPAIRING

Electrical Equipment Installing & Repairing.
Industrial Machinery Mechanics & Repairmen.

MATERIAL HANDLING & RELATED (includes such occupations as hoisting, material handling equipment operators and packaging).

The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your firm's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

(SIC 291)

PARTICIPANT INFORMATION

COMPANY NAME: _____

UNION NAME (If appropriate): _____

AFFILIATED ORGANIZATIONS: _____

MAIN ADDRESS: _____

TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

Divisions/Branches/Affiliates	Products/Services
_____	_____
_____	_____
_____	_____
_____	_____

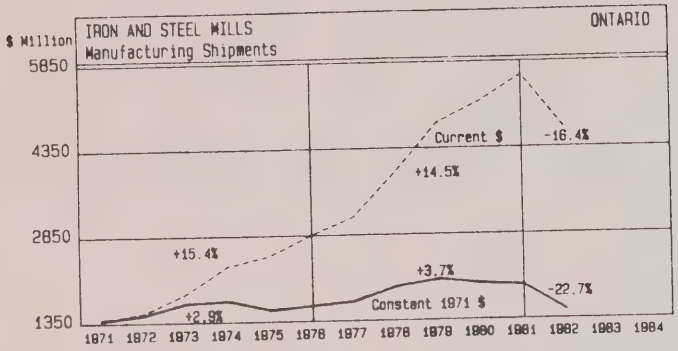
SURVEY PARTICIPANTS

Names	Position	Number of Years With Company	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(principal respondent)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(other respondents)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐

(SIC 291)

CHART 1

INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO*



* Source: Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. Graph, constant dollar calculation and rates of change by Economics Practice, Currie, Coopers & Lybrand.

(SIC 291)

1. INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO

Chart 1, opposite, illustrates manufacturing shipments for the Iron and Steel Industry in ONTARIO in current dollars (dotted line) and in constant dollars (current dollars adjusted for price changes - solid line).

The rates shown for the first three time periods listed below are expressed in annual compound rates of change (in constant dollars).

Using these rates as a guide, please **estimate** the annual compound rates of change (in constant dollars) of your industry's value of manufacturing shipments in Ontario for the next five periods listed.

Manufacturing Shipments in Ontario	Annual Compound Rate of Change (in constant dollars)
1971 to 1976	+2.9 %
1976 to 1981	+3.7 %
1981 to 1982	-22.7 %
	Your Estimates (Indicate if + or -)
1982 to 1983?	___ %
1983 to 1984?	___ %
1984 to 1985?	___ %
1985 to 1990?	___ %
1991 to 1995?	___ %

(SIC 291)

2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for employment in the Iron & Steel Industry in ONTARIO between 1971 and 1982. (Statistics Canada, Cat. No. 31-203).

Would you please indicate your estimates for the five following periods listed below (i.e., 1983-1995). Provide your estimates in actual numbers or in annual compound rates of change, **whichever is easier.**

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e., total "head count".

Total Employment in Ontario		Annual Compound Rates of Change	
1971	38,037		
1981	42,910	1971-1981	+1.2 %
1982	41,603	1981-1982	-3.0 %

Your Estimates:

				(Indicate if + or -)
1983?	_____	OR	1982-1983?	____ %
1984?	_____	OR	1983-1984?	____ %
1985?	_____	OR	1984-1985?	____ %
1990?	_____	OR	1985-1990?	____ %
1995?	_____	OR	1990-1995?	____ %

(SIC 291)

3. FIRM'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your firm has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your firm. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your firm between **1985** and **1990**. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your firm between **1991** and **1995**. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

(SIC 291)

CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY THE FIRM

		3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1991-1995?
1.	DESIGN TECHNOLOGIES			
	Computer-Aided Design (CAD)	☐	☐	☐
	Computer-Aided Engineering (CAE)	☐	☐	☐
	CAD/CAM Integration	☐	☐	☐
	Any Others? _____	☐	☐	☐
	_____	☐	☐	☐
2.	MANUFACTURING PLANNING & CONTROL SYSTEMS			
	Computerized Financial Systems	☐	☐	☐
	Computerized Order Entry/Inventory Control	☐	☐	☐
	Computer-Aided Process Planning	☐	☐	☐
	Manufacturing Resource Planning Systems (MRP)	☐	☐	☐
	Automated Shop Floor Data Collection	☐	☐	☐
	Computerized Decision Support Systems	☐	☐	☐
	Computerized Maintenance Planning & Control	☐	☐	☐
	Any Others? _____	☐	☐	☐
	_____	☐	☐	☐
3.	MANUFACTURING PROCESS TECHNOLOGIES			
	Ladle Metallurgy (Electronic Ladle)	☐	☐	☐
	Continuous Casting (Molten To "Near Net" Shapes)	☐	☐	☐
	Automatic Casting/Molding	☐	☐	☐
	Numerically Controlled Machines (NC)	☐	☐	☐
	Computer Controlled CN Machines (CNC)	☐	☐	☐
	CAD Directed CNC	☐	☐	☐
	Computerized Process Control Systems	☐	☐	☐
	Computer-Aided Inspection & Testing	☐	☐	☐
	Robotic Applications	☐	☐	☐
	Flexible Manufacturing Technologies	☐	☐	☐
	Computer Integrated Manufacturing (CIM)			
	Any Others? _____			
4.	MATERIALS HANDLING TECHNOLOGIES	☐	☐	☐
	Automatic Bulk Handlers/Feeder Systems	☐	☐	☐
	Automated Conveyor/Vehicle Systems	☐	☐	☐
	Automated Storage & Retrieval	☐	☐	☐
	Computer Controlled Conveyor/Vehicles	☐	☐	☐
	Automated Warehouse	☐	☐	☐
	Any Others? _____	☐	☐	☐
	_____			
5.	TELECOMMUNICATIONS TECHNOLOGIES	☐	☐	☐
	Facsimile (FAX) Link: HO/Plants	☐	☐	☐
	Computer Link: HO/Plant(s)	☐	☐	☐
	Computer Link: Suppliers/Customers	☐	☐	☐
	Any Others? _____			
	_____			
6.	OTHER TECHNOLOGIES	☐	☐	☐
	_____	☐	☐	☐
	_____			
	HAVE/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

(SIC 291)

4. FORCES DRIVING THE FIRM'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your firm's internal or external environment which could accelerate your **firm's need to adopt** these new technologies over the next 10 years in ONTARIO?

4b. What is the **second most important factor** likely to accelerate your firm's need to adopt these new technologies?

4c. And what is the **third most important** factor?

5. FACTORS AFFECTING THE FIRM'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your firm's internal or external environment that could slow down the speed at which your firm will adopt these new technologies over the next 10 years in ONTARIO?

5b. What is the **second most important** factor that could slow down your firm's adoption of these new technologies?

5c. And what is the **third** most important factor?

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your firm over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your firm is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6A.

6b. Please indicate the **occupations** in which you expect your firm will have **a shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6B.

(SIC 291)

CHART 6
IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS
IN YOUR FIRM OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
PROCESSING	☐	☐
MACHINING		
• Machinist & Machine-Tool Setting-Up	☐	☐
• Machine-Tool Operators	☐	☐
• Welding/Soldering	☐	☐
FABRICATING, ASSEMBLING & REPAIRING		
• Electrical Equipment Installing & Repairing	☐	☐
• Industry Machinery Mechanics & Repairmen	☐	☐
MATERIAL HANDLING	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

(SIC 291)

7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN FIRM OVER NEXT 10 YEARS

The following questions relate to the actions your firm will likely take to deal with the oversupply of people in your firm resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the **steps** your firm will likely take that will **affect the largest number of people** in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your firm is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc. etc.,

7b. Again, for each of these occupations, identify the step your firm may take that will affect the **second largest number of people** in that occupation. Record on Chart 7, under column 7b.

(SIC 291)

CHART 7
STEPS FIRM WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Machinist & Machine-Tool Setting-Up		
• Machine-Tool Operators		
• Welding/Soldering		
FABRICATING, ASSEMBLING & REPAIRING		
• Electrical Equipment Installing & Repairing		
• Industry Machinery Mechanics & Repairmen		
MATERIAL HANDLING		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

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8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your firm may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the **step** your firm will likely take that will **affect the largest number of people** in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your firm is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of firm's skilled people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc...

8b. Please indicate, for each occupation, the **step** your firm may take that will affect the **second largest number of people** in that occupation. Record your answers in column 8b.

(SIC 291)

CHART 8
STEPS FIRM WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Machinist & Machine-Tool Setting-Up		
• Machine-Tool Operators		
• Welding/Soldering		
FABRICATING, ASSEMBLING & REPAIRING		
• Electrical Equipment Installing & Repairing		
• Industrial Machinery Mechanics & Repairmen		
MATERIAL HANDLING		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

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9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the **nature of the impact** on selected occupations in ONTARIO.

9a. For selected occupations in your firm, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require. Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the company's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

(SIC 291)

CHART 9
IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE, & RELATED	___	___	___	_____
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Engineers	___	___	___	_____
• Engineering Technicians & Technologists	___	___	___	_____
• Systems Analysts & Computer Programmers	___	___	___	_____
PROCESSING	___	___	___	_____
MACHINING				
• Machinist & Machine-Tool Setting-Up	___	___	___	_____
• Machine-Tool Operators	___	___	___	_____
• Welding/Soldering	___	___	___	_____
FABRICATING & ASSEMBLING				
• Electrical Equipment Installing & Repairing	___	___	___	_____
• Industrial Machinery Mechanics & Repairmen	___	___	___	_____
MATERIAL HANDLING	___	___	___	_____
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	_____
_____	___	___	___	_____
_____	___	___	___	_____

(SIC 291)

10. TRAINING/RETRAINING

These questions are about the current and future importance of **training and retraining** in your organization.

10a. Please indicate what were your firm's total training costs as a percent of total labour costs in **1981**. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your firm, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your firm's total training costs as a percent of total labour costs will be in **1984** (to year end). Record your answer on line 10b.

10c. What do you estimate for **1985**, (line 10c)?

10d. What do you estimate it will be in **1990**, (line 10d)?

10e. What do you estimate it will be in **1995**, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

(SIC 291)

CHART 10

TRAINING COSTS OF FIRM

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

(SIC 291)

11. FIRM'S EMPLOYMENT TRENDS

In this section, we would like to determine how the firm's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your firm's internal and external environment, what is the **single most important factor** which will have an impact on your firm's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The **second most important factor**? _____

_____

11c. The **third most important factor**? _____

_____

11d. Please indicate **total employees** (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for **1971, 1981** and **1984** from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for **1985, 1990** and **1995.**

11e. Please indicate the **percent** of your total employment in ONTARIO that are **part-time** employees (i.e., less than normal full work week), for **1981** and **1984.** Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for **1985, 1990 and 1995.**

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11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (**F.T.E.**) figure for your firm for **1981** and **1984** in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for **1985, 1990** and **1995.**

By **F.T.E.** we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your firm or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

FIRM'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your firm in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of <u>each</u> occupation listed as a percent of your firm's total employment in ONTARIO in **1981**. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of <u>each</u> selected occupation listed as a percent of your firm's total employment in ONTARIO in **1984**. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in **1985**. Record in column 12c.

12d. Please estimate the same for each selected occupation in **1990**. Record in column 12d.

12e. Please estimate the same for each selected occupation in **1995**. Record in column 12e.

(SIC 291)

CHART 12

TRENDS IN FIRM'S OCCUPATIONAL STRUCTURE
BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED						1*
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						2*
• Engineers						
• Engineering Technicians & Technologists						
• Systems Analysts & Computer Programmers						
• All Other Natural Science, Engineering & Mathematics						
PROCESSING						3*
MACHINING						4*
• Machinist & Machine-Tool Setting-Up						
• Machine-Tool Operators						
• Welding/Soldering						
• All Other Machining Occupations						
FABRICATING, ASSEMBLING & REPAIRING						5*
• Electrical Equipment Installing & Repairing						
• Industrial Machinery Mechanics & Repairmen						
• All Other Fabricating, Assembling, & Repairing Occupations						
MATERIAL HANDLING						6*
ALL OTHER OCCUPATIONS						7*
* FIRM'S TOTAL EMPLOYMENT IN ONTARIO (1+2+3+4+5+6+7= 100%)	100%	100%	100%	100%	100%	

13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your firm's employment in ONTARIO **by sex** for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO **by each occupation in 1981.** Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO **in 1984.** Record your answer in Column 13b.

(SIC 291)

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT			13b 1984 EMPLOYMENT		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED	___% +	___%	=100%	___% +	___%	=100%
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						
• Engineers	___% +	___%	=100%	___% +	___%	=100%
• Engineering Technicians & Technologists	___% +	___%	=100%	___% +	___%	=100%
• Systems Analysts & Computer Programmers	___% +	___%	=100%	___% +	___%	=100%
PROCESSING	___% +	___%	=100%	___% +	___%	=100%
MACHINING						
• Machinist & Machine-Tool Setting-Up	___% +	___%	=100%	___% +	___%	=100%
• Machine-Tool Operators	___% +	___%	=100%	___% +	___%	=100%
• Welding/Soldering	___% +	___%	=100%	___% +	___%	=100%
FABRICATING, ASSEMBLING & REPAIRING						
• Electrical Equipment Installing & Repairing	___% +	___%	=100%	___% +	___%	=100%
• Industrial Machinery Mechanics & Repairmen	___% +	___%	=100%	___% +	___%	=100%
MATERIAL HANDLING	___% +	___%	=100%	___% +	___%	=100%
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% +	___%	=100%	___% +	___%	=100%

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14. ORGANIZED LABOUR IN YOUR FIRM IN ONTARIO

14a. Does your firm have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ **If no, go on to Question 14c.**

14b. If yes, what percent of your firm's total employment in ONTARIO is currently **(1984)** unionized?

____%

14c. What percent of your firm's total employment in ONTARIO do you estimate will be unionized by **1985, 1990** and by **1995**?

- 1985? ____%
- 1990? ____%
- 1995? ____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your firm in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your firm in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your firm in ONTARIO. Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the firm's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your firm the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Job Security
- Seniority
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Firm			
15b. Number of Firm's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

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15g. In general, what has been the union's position on the adoption of new technologies in your firm? Please explain.

_____

_____

_____

_____

_____

(SIC 291)

16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the **relationship between workers and management** in your firm as decisions are made on the adoption of new technology.

16a. Does your firm have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
- at company level?	☐	☐
- at division/plant level?	☐	☐
- at department/area level?	☐	☐
- at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies? Please comment.

_____

_____

_____

_____

_____

_____

(SIC 291)

17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, **in today's dollars**, your firm plans to spend on **construction of structures and buildings** in ONTARIO over the period **1985 to 1990** and over the period **1991 to 1995**. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of **new technologies**? Record under column 17b.

17c. Would you indicate how much, **in today's dollars**, your firm plans to spend on **machinery and equipment** over the period **1985 to 1990** and over the period **1991 to 1995** in ONTARIO. Record under column 17c.

17d. What percent of this spending on **machinery and equipment** will be for **new technologies**? Record under column 17d.

17e. Please indicate what criterion your firm will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____
If Yes, how long?

Return on investment ☐ _____
If Yes, what rate?

Other _____ ☐ _____
(specify) Please elaborate

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ___%
External funds ___%
100%

(SIC 291)

CHART 17

CAPITAL INVESTMENT PLANS
IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

(SIC 291)

18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your firm's plans for adopting new technologies in ONTARIO.

18a. Does your firm currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your firm have a plan to deal with future human resource needs?

Yes ☐ No ☐ **If no, go to Question 18d.**

18c. Up to what year has your firm planned for its human resource needs?

_____
(WRITE IN YEAR)

18d. Does your firm have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ **If no, go to Question 19. on p. 25.**

18e. Up to what year has your firm planned for its capital requirements?

_____
(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated.

(Please circle answer)

NOT AT ALL INTEGRATED	1	2	3	4	5	HIGHLY INTEGRATED

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19. **Please indicate below any other comments on the issue of employment and new technology you wish to make.**

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

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IRON AND STEEL INDUSTRY

Number of Firms and Unions Responding by Question

Question		Firms	Unions
Question 1	1982-1983	3	
	1983-1984	3	
	1984-1985	3	
	1985-1990	3	
	1990-1995	3	
Question 2		*	
Question 3	a,b,c	3	
Question 4	a,b,c	3	
Question 5	a,b,c	3	
Question 6	a,b	3	
Question 7	a	2	
	b	2	
Question 8	a	3	
	b	3	
Question 9	a	3	
	b	3	
	c	3	
Question 10	a,b,c,d,e	2	
Question 11	a,b,c,	3	
	d	3	
	e	3	
	f	3	
Question 12	a,b,c,d,e	3	
Question 13		*	
Question 14	a	3	
	b	2	
	c	3	
	d	0	
Question 15	a	2	1
	b	2	1
	c	*	*
	d	2	1
	e	2	1
	f	2	1
	g	2	1
Question 16	a	3	1
	b	3	1
Question 17	a	3	
	b	3	
	c	3	
	d	3	
	e	3	
	f	3	
Question 18	a	3	
	b	3	
	c	2	
	d	3	
	e	3	
	f	3	

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

Manufacturing Sector		Service Sector
Small	20- 99 employees	20-199 employees
Medium	100-499 employees	200-999 employees
Large	500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR		ORGANIZATION SIZE EXCLUSION
Manufacturing Sector		
291	Iron & Steel Mills	less than 500
321	Aircraft & Aircraft Parts	less than 50
Service Sector		
701	Banks and Trusts	less than 50
721	General and Life Insurance	less than 50
735	Insurance Brokers	less than 50
909	Federal Government	less than 500
931	Provincial Government	less than 200
951	Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For the Iron and Steel Industry, the sample yields a minimum confidence level of 90 percent with an associated allowable error of 23 percent. That is, we would expect that the estimated employment level for the sector has a 90 percent chance of being within $\pm$ 23 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 90 of these samples we would expect to have an estimated employment level within $\pm$ 23 percent of the actual employment level found in the sample frame. This relatively high allowable error is accounted for by the fact that one of the major steel producers elected to be interviewed as part of the expert consultation and not to take part in the detailed survey. The views of this company have been taken into consideration when compiling the report.

TABLE 1: SUMMARY - SELECTED MANUFACTURING INDUSTRIES

SAMPLE FRAME AND SAMPLE

SIC Code	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE				
		Number of Firms	Number of Employees[1]	Firm Size Cut Off	Number of Firms	Number of Employees[2]	Share of Universe	Number of Firms	Number of Unions	Number of Employees	Reliability Level (min.)	Allowable Error
											Percent	
291	Iron and Steel Mills	17	41,603	500	7	39,900	96	3	1	21,833	90	23
304	Metal Stamping, Pressing and Coating Industry	185	17,730	20	145	17,200	97	14	3	4,507	99	5
306	Hardware, Tool and Cutlery Manufacturing	225	12,826	20	135	11,500	90	11	6	1,489	94	5
309	Miscellaneous Metal Fabricating Industries	132	12,235	20	110	12,000	98	11	6	2,694	99	5
315	Miscellaneous Machinery and Equipment Manufacturers	304	36,904	20	262	36,500	99	12	3	3,972	99	5
318	Office and Store Machinery Manufacturers	29	10,485	20	29	9,800	93	7	0	11,814	99	5
335	Communications Equipment Manufacturers	67	28,090	20	65	27,800	99	12	2	14,946	90	11
321	Aircraft and Aircraft Parts Manufacturers	22	12,732	50	17	12,000	94	10	5	11,737	95	7
165	Plastic Processing	196	19,218	20	169	18,800	98	13	4	2,400	99	5

(1) Source: Census of Manufacturing, 1982, Statistics Canada, Catalogue No. 31-203.

(2) Rounded to nearest 100.

APPENDIX D

HISTORICAL TABLES

TABLE D.1

CAPACITY OF THE TWELVE LARGEST CANADIAN STEEL PRODUCERS AS OF JANUARY 1, 1984

Thousands of Metric Tonnes

		Raw Steel Capacity (000 tonnes)		Per Cent of Total
Integrated Producers				
Stelco:	Hamilton	5,262		
	Nanticoke	1,440		
	McMaster (Quebec)	272		
	Edmonton	286		
			7,260	33.1
Dofasco:	Hamilton		4,333	19.8
Algoma:	Sault Ste. Marie		4,081	18.6
Sidbec-Dosco:	Contrecoeur	1,134		
	Longueuil	141		
	Montreal	190		
			1,465	6.7
Sydney Steel:	Sydney		891	4.1
Electric Furnace Producers				
Ipsco	Regina		680	3.1
Lake Ontario	Whitby		910	4.2
Ivaco	L'original, Ont.		310	1.4
Burlington	Hamilton		295	1.3
Manitoba Rolling Mills	Winnipeg		275	1.3
Western Cdn.	Vancouver	175		0.8
Steel	Calgary	120		0.5
			295	1.3
Specialty Steel Producers				
Atlas	Welland		295	1.3
Steel Capacity - Twelve largest firms			21,090	96.2
TOTAL			21,909	100.0

Source: Statistics Canada, Primary Iron and Steel, Cat. No. 41-001, December 1983.

TABLE D.2

CANADIAN MILL SHIPMENTS OF ROLLED STEEL PRODUCTS

Thousands of Metric Tonnes

1981 - 1983

	1981	1982	1983
Ingots and semis	996.8	525.0	747.7
Wire Rods	987.2	898.0	1,024.9
Rails and heavy structural shapes	839.7	412.1	458.6
Track material	68.0	57.2	50.0
Concrete reinforcing bars	681.0	542.7	526.4
Other hot rolled bars	1,022.0	753.1	850.9
Cold finished bars	95.0	68.3	90.0
Structural shapes	520.7	331.6	387.9
Plate	1,802.8	1,122.6	1,014.6
Hot rolled sheet, strip	2,274.3	1,998.9	2,112.7
Cold reduced sheet, strip, other and coated (including tin plate)	1,761.0	1,709.5	1,784.4
Galvanized sheets	950.7	930.2	949.6
TOTAL	11,999.3	9,349.2	9,997.7

Figures may not add to total due to rounding.

Source: Statistics Canada, Primary Iron and Steel, Cat. No. 41-001, December issues.

TABLE D.3

DISPOSITION OF ROLLED STEEL PRODUCTS TO CONSUMING INDUSTRIES

Thousands of Metric Tonnes

1981 - 1983

End Use Product	1981	1982	1983
Wholesalers, Warehouses and Steel Service Centres	1,963.6	1,230.6	1,551.1
Motor Vehicles and Parts	1,256.5	1,082.7	1,640.2
Agricultural Equipment	153.3	93.1	89.7
Contractors Products	492.8	345.5	400.1
Metal Building Systems	63.7	38.4	38.6
Steel Fabrication	1,144.3	666.2	717.4
Containers	415.9	404.4	412.3
Machinery and Industrial Packaging Equipment	485.9	344.0	367.6
Wires and Fasteners	741.5	596.7	775.8
Natural Resources Industries	242.6	177.9	154.8
Appliances and Utensils	129.5	92.9	119.6
Stamping, Pressing and Coating	457.5	336.6	390.8
Railway Maintenance	346.9	245.8	286.8
Railway Cars and Bars	119.2	53.1	50.2
Shipbuilding	27.9	25.6	18.7
Pipes and Tubes	1,926.5	1,095.3	1,039.5
Miscellaneous	55.9	47.7	39.9
Domestic Shipments	10,023.4	6,876.4	8,093.1
Producer Exports	1,975.9	2,472.8	1,904.5
Total Mill Shipments	11,999.3	9,349.2	9,997.6

Figures may not add to total due to rounding.

Source: Statistics Canada, Primary Iron and Steel, Cat. No. 41-001, December issues.

TABLE D.4

DOMESTIC SHIPMENTS, IMPORTS, APPARENT CONSUMPTION, EXPORTS AND TOTAL CANADIAN MILL SHIPMENTS OF ROLLING MILL PRODUCTS

Millions of Metric Tonnes
1974 and 1979-1983

	Domestic Shipments	Imports	Apparent Consumption	Exports	Total Mill Shipments
1974	9.4	2.8	12.2	0.9	10.3
1979	10.6	1.5	12.1	1.6	12.2
1980	9.5	1.0	10.5	2.7	12.2
1981	10.0	2.0	12.0	2.0	12.0
1982	6.9	0.9	7.8	2.4	9.3
1983	8.1	1.0[e]	9.1[e]	1.9	10.0

	Imports as a Per Cent of Apparent Consumption	Exports as a Per Cent of Total Mill Shipments	Trade Balance Million Metric Tonnes
1974	22.7	9.1	(1.9)
1979	12.7	13.3	0.1
1980	9.5	22.2	1.7
1981	16.7	16.7	0.0
1982	11.8	26.3	1.5
1983	10.9	18.2	0.9

e Imports for December 1983 are estimated
( ) indicates trade deficit

Calculations based on unrounded data.

TABLE D.5

HOURLY COMPENSATION COSTS FOR PRODUCTION WORKERS
IRON AND STEEL MANUFACTURING

1982 (PRELIMINARY ESTIMATES)

COUNTRY OR AREA	EXCHANGE RATE		AVERAGE HOURLY EARNINGS IN NATIONAL CURRENCY	RATIO OF ADDITIONAL COMPENSATION TO HOURLY EARNINGS	HOURLY COMPENSATION		
	NATIONAL CURRENCY UNIT	NATIONAL CURRENCY UNITS PER U.S. DOLLAR			NATIONAL CURRENCY	U.S. DOLLARS	INDEX U.S.=100
IRON AND STEEL (1)							
UNITED STATES	DOLLAR	-----	13.36	70.2	22.74	22.74	100
CANADA (2)	DOLLAR	1.234	13.18	36.5	17.99	14.58	64
BRAZIL	CRUZEIRO	179.5	452.08	25	565.10	3.15	14
MEXICO	PESO	72.99	118.00	46.5	172.87	2.37	10
JAPAN	YEN	249.1	2088	18.1	2466	9.90	44
KOREA	WON	731.1	1142	15-20	1342	1.84	8
AUSTRIA	SHILLING	17.06	73.28	91.6	40.40	8.23	36
BELGIUM	FRANC	45.78	318.00	74.5	554.91	12.12	53
FRANCE	FRANC	6.579	32.24	96.5	63.35	9.63	42
GERMANY	MARK	2.428	15.53	80.9	28.09	11.57	51
ITALY	LIRA	1354	5987	97.5	11824	8.73	38
LUXEMBOURG	FRANC	45.69	304.00	38.8	421.95	9.24	41
NETHERLANDS	GUILDER	2.672	19.10	75.2	33.46	12.52	55
UNITED KINGDOM	POUND	.5721	3.35	39.8	4.68	8.19	36
IRON AND STEEL INCLUDING FOUNDRIES							
UNITED STATES	DOLLAR	-----	12.24	65.5	20.26	20.26	100
JAPAN	YEN	249.1	1821	18.1	2151	8.63	43
KOREA	WON	731.1	1079	15-20	1268	1.73	9
TAIWAN	DOLLAR	39.12	65.76	15-20	77.27	1.98	10
SPAIN (3)	PESETA	110.1	548	40	767	6.97	--
SWEDEN	KRONA	6.284	42.83	61.6	69.21	11.01	54

(1) BLAST FURNACES, STEEL WORKS, AND ROLLING AND FINISHING MILLS (US SIC 331).
(2) EXCLUDING STEEL PIPE AND TUBE MILLS AS WELL AS STEEL FOUNDRIES.
(3) PRIMARY METALS.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, Hourly Compensation Costs for Production Workers in Iron and Steel Manufacturing, (unpublished data), January 1984.

TABLE D.5 (Continued)

HOURLY COMPENSATION COSTS FOR PRODUCTION WORKERS
IRON AND STEEL MANUFACTURING

1983 (PROVISIONAL ESTIMATES)

COUNTRY OR AREA	EXCHANGE RATE(1)		AVERAGE HOURLY EARNINGS IN NATIONAL CURRENCY	RATIO OF ADDITIONAL COMPENSATION TO HOURLY EARNINGS	HOURLY COMPENSATION		
	NATIONAL CURRENCY UNIT	NATIONAL CURRENCY UNITS PER U.S. DOLLAR			NATIONAL CURRENCY	U.S. DOLLARS	INDEX U.S.=100
IRON AND STEEL (2)							
UNITED STATES	DOLLAR	-----	12.94	67.9	21.73	21.73	100
CANADA (3)	DOLLAR	1.233	13.84	36.5	18.89	15.32	71
BRAZIL	CRUZEIRO	579.8	990.22	25	1237.78	2.13	10
JAPAN	YEN	237.4	2154	18.1	2544	10.72	49
KOREA	WON	775.8	1331	15-20	1564	2.02	9
AUSTRIA	SHILLING	17.97	76.89	92.8	148.24	8.25	38
BELGIUM	FRANC	51.14	331.52	84.2	610.66	11.94	55
FRANCE	FRANC	7.622	35.47	99.4	70.73	9.28	43
GERMANY	MARK	2.555	15.85	81.3	28.74	11.25	52
ITALY	LIRA	1520	6954	98.9	13832	9.10	42
NETHERLANDS	GUILDER	2.855	19.92	74.2	34.70	12.15	56
UNITED KINGDOM	POUND	.6597	3.73	40.3	5.23	7.93	36
IRON AND STEEL INCLUDING FOUNDRIES							
UNITED STATES	DOLLAR	-----	12.00	63.5	19.62	19.62	100
JAPAN	YEN	237.4	1879	18.1	2219	9.35	48
KOREA	WON	775.8	1257	15-20	1477	1.90	10
TAIWAN	DOLLAR	40.04	70.17	15-20	82.45	2.06	10
SWEDEN	KRONA	7.673	46.43	62.1	75.26	9.81	50

(1) PRELIMINARY ANNUAL AVERAGE; TAIWAN, JANUARY-OCTOBER AVERAGE.
(2) BLAST FURNACES, STEEL WORKS, AND ROLLING AND FINISHING MILLS (US SIC 331).
(3) EXCLUDING STEEL PIPE AND TUBE MILLS AS WELL AS STEEL FOUNDRIES.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, Hourly Compensation Costs for Production Workers in Iron and Steel Manufacturing, (unpublished data), January 1984.

TABLE D.6

IRON AND STEEL MILLS (SIC 291)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	18	17	17	17	18	17	19	20	22	23	22	23		
CAPACITY UTILIZATION RATE, CANADA	86.4	84.6	92.4	81.9	76.2	76.7	78.1	83.8	86.4	83.9	72.6	54.6	59.0	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	1,394.5	1,517.8	1,849.3	2,330.4	2,498.8	2,856.9	3,159.6	3,937.3	4,788.4	5,149.2	5,610.4	4,691.9		
MANUFACTURING VALUE ADDED	736.5	778.3	969.8	1,116.6	1,085.8	1,231.4	1,422.3	1,653.6	2,039.1	2,056.3	2,260.2	1,731.9		
WAGES & SALARIES	363.8	400.4	463.9	537.1	590.2	664.2	730.4	809.7	927.6	1,063.1	1,081.2	1,215.6		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	29,746	29,974	31,781	31,926	32,305	32,318	32,977	34,895	36,699	37,221	32,963	31,272		
ADMINISTRATIVE STAFF	8,291	8,023	8,176	8,289	8,302	7,997	7,937	8,383	8,720	9,658	9,947	10,331		
TOTAL	38,037	37,997	39,957	40,215	40,607	40,315	40,914	43,278	45,419	46,879	42,910	41,603		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	32.6	36.2	32.1	81.3	111.0	90.1	78.5	52.5	60.1	99.5	104.8	74.3	17.8	10.4
MACHINERY & EQUIPMENT	169.0	170.9	206.0	328.4	430.7	301.9	313.7	257.0	310.0	484.7	605.2	342.0	180.5	216.1
TOTAL	201.6	207.1	238.1	409.7	541.7	392.0	392.2	309.5	370.1	584.2	710.0	416.3	198.3	226.5
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	19,363	20,482	24,271	27,766	26,740	30,545	34,763	38,208	44,896	43,864	52,672	41,628		
VALUE ADDED/$ LABOUR	2.02	1.94	2.09	2.08	1.84	1.85	1.95	2.04	2.20	1.93	2.09	1.42		
VALUE ADDED/$ LABOUR (United States)	1.94	1.90	2.00	2.32	1.95	1.88	1.82	1.98	1.83	1.83	1.85	1.63		
EXPORTS ($ Million)	197.7	204.0	217.9	325.3	273.4	398.3	551.8	735.7	845.4	1,087.5	1,115.8	1,132.3	,,012.7	
IMPORTS ($ Million)	170.3	192.7	250.3	424.7	278.8	231.8	286.2	376.2	644.3	452.2	952.3	402.0	484.1	
TRADE BALANCE ($ Million)	27.4	11.3	(32.5)	(99.4)	(5.4)	166.5	265.6	359.5	201.1	635.2	163.5	730.3	528.6	
NORMALIZED TRADE BALANCE	0.074	0.029	(0.069)	(0.133)	(0.010)	0.264	0.317	0.323	0.135	0.413	0.079	0.476	0.353	

( ) indicates deficit

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA, Cat. No. 31-203; INVESTMENT STATISTICS - MANUFACTURING SUB-INDUSTRIES AND SELECTED ENERGY-RELATED INDUSTRIES, Cat. No. 61-214; PRIMARY IRON AND STEEL, Cat. No. 41-001; STEEL INGOTS AND PIG IRON, Cat. No. 41-002; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand.
Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.7

IRON AND STEEL MILLS (SIC 291)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-5.6	0.0	0.0	5.9	-5.6	11.8	5.3	10.0	4.5	-4.3	4.5		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	8.8	21.8	26.0	7.2	14.3	10.6	24.6	21.6	7.5	9.0	-16.4		
MANUFACTURING VALUE ADDED	5.7	24.6	15.1	-2.8	13.4	15.5	16.3	23.3	0.8	9.9	-23.4		
WAGES & SALARIES	10.1	15.9	15.8	9.9	12.5	10.0	10.8	14.6	14.6	1.7	12.4		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	0.8	6.0	0.5	1.2	.0	2.0	5.8	5.2	1.4	-11.4	-5.1		
ADMINISTRATIVE STAFF	-3.2	1.9	1.4	0.2	-3.7	-0.8	5.6	4.0	10.8	3.0	3.9		
TOTAL	-0.1	5.2	0.6	1.0	-0.7	1.5	5.8	4.9	3.2	-8.5	-3.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	11.0	-11.3	153.3	36.5	-18.8	-12.9	-33.1	14.5	65.6	5.3	-29.1	-76.0	-41.6
MACHINERY & EQUIPMENT	1.1	20.5	59.4	31.2	-29.9	3.9	-18.1	20.6	56.4	24.9	-43.5	-47.2	19.7
TOTAL	2.7	15.0	72.1	32.2	-27.6	0.1	-21.1	19.6	57.8	21.5	-41.4	-52.4	14.2
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	5.8	18.5	14.4	-3.7	14.2	13.8	9.9	17.5	-2.3	20.1	-21.0		
EXPORTS	3.2	6.8	49.3	-16.0	45.7	38.6	33.3	14.9	28.6	2.6	1.5	-10.6	
IMPORTS	13.1	29.9	69.6	-34.4	-16.9	23.5	31.4	71.3	-29.8	110.6	-57.8	20.4	

SOURCE: Calculated from Table D.6 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.8

IRON AND STEEL MILLS (SIC 291)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	18	17	17	17	18	17	19	20	22	23	22	23		
CAPACITY UTILIZATION RATE, CANADA	86.4	84.6	92.4	81.9	76.2	76.7	78.1	83.8	86.4	83.9	72.6	54.6	59.0	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	1,394.5	1,470.8	1,675.1	1,709.8	1,542.5	1,612.2	1,681.5	1,931.0	2,049.0	1,967.6	1,932.6	1,493.3		
MANUFACTURING VALUE ADDED	736.5	746.2	873.7	933.6	818.3	815.5	869.9	987.2	1,071.0	947.6	914.3	700.9		
WAGES & SALARIES	363.8	385.0	415.7	432.5	429.9	447.3	455.1	468.8	491.6	508.9	463.2	469.7		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	29,746	29,974	31,781	31,926	32,305	32,318	32,977	34,895	36,699	37,221	32,963	31,272		
ADMINISTRATIVE STAFF	8,291	8,023	8,176	8,289	8,302	7,997	7,937	8,383	8,720	9,658	9,947	10,331		
TOTAL	38,037	37,997	39,957	40,215	40,607	40,315	40,914	43,278	45,419	46,879	42,910	41,603		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	32.6	34.2	28.1	61.1	74.2	56.6	46.4	29.1	30.4	44.8	42.3	27.4	6.3	3.5
MACHINERY & EQUIPMENT	169.0	166.6	192.7	269.6	309.9	205.5	195.8	143.8	157.6	223.5	250.0	130.8	67.0	76.2
TOTAL	201.6	200.8	220.8	330.7	384.1	262.1	242.2	172.9	188.0	268.3	292.3	158.2	73.3	79.7
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	19,363	19,638	21,866	23,215	20,151	20,228	21,262	22,811	23,580	20,214	21,308	16,847		

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for Iron and Steel Mills; Value Added deflated by the Implicit Price Index for Gross Domestic Product, Iron and Steel Mills; Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D.6. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.9

IRON AND STEEL MILLS (SIC 291)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-5.6	0.0	0.0	5.9	-5.6	11.8	5.3	10.0	4.5	-4.3	4.5		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	5.5	13.9	2.1	-9.8	4.5	4.3	14.8	6.1	-4.0	-1.8	-22.7		
MANUFACTURING VALUE ADDED	1.3	17.1	6.9	-12.4	-0.3	6.7	13.5	8.5	-11.5	-3.5	-23.3		
WAGES & SALARIES	5.8	8.0	4.0	-0.6	4.1	1.7	3.0	4.9	3.5	-9.0	1.4		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	0.8	6.0	0.5	1.2	.0	2.0	5.8	5.2	1.4	-11.4	-5.1		
ADMINISTRATIVE STAFF	-3.2	1.9	1.4	0.2	-3.7	-0.8	5.6	4.0	10.8	3.0	3.9		
TOTAL	-0.1	5.2	0.6	1.0	-0.7	1.5	5.8	4.9	3.2	-8.5	-3.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	4.9	-17.8	117.4	21.4	-23.7	-18.0	-37.3	4.5	47.4	-5.6	-35.2	-77.0	-44.4
MACHINERY & EQUIPMENT	-1.4	15.7	39.9	14.9	-33.7	-4.7	-26.6	9.6	41.8	11.9	-47.7	-48.8	13.7
TOTAL	-0.4	10.0	49.8	16.1	-31.8	-7.6	-28.6	8.7	42.7	8.9	-45.9	-53.7	8.7
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	1.4	11.3	6.2	-13.2	0.4	5.1	7.3	3.4	-14.3	5.4	-20.9		

SOURCE: Calculated from Table D.8 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.10

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	50,720	2.4
II	TWO DIGIT LEVEL		
	MACHINING AND RELATED	5,545	(0.4)
	MATERIAL HANDLING AND RELATED	4,955	1.7
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	2,965	2.7
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	5,575	4.5
	PROCESSING	15,100	5.3
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,775	6.7
III	FOUR DIGIT LEVEL		
	MACHINING AND RELATED		
	Machine-Tool Operating	575	(4.0)
	Foremen, Metal Machining	325	(3.7)
	Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	280	(3.6)
	Forging	170	(2.1)
	Metalworking-Machine Operators, n.e.c.	585	(2.0)
	Foremen, Metal Shaping and Forming, Except Machining	210	(0.5)
	Sheet-Metal Workers	330	(0.2)
	Machinist and Machine-Tool Setting-Up	925	1.0
	Welding and Flame Cutting	1,575	1.7
	Metal Shaping and Forming, Except Machining, n.e.c.	160	4.8
	TOTAL	5,545	(0.4)

TABLE D.10 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
MATERIAL HANDLING AND RELATED		
Labouring and Other Elemental Work, Material-Handling, n.e.c.	265	(6.3)
Packaging, n.e.c.	115	0.0
Other Material Handling and Related, n.e.c.	100	1.6
Hoisting, n.e.c.	3,415	2.3
Material-Handling Equipment Operators, n.e.c.	670	3.8
Longshoremen, Stevedores and Freight Handlers	320	5.1
TOTAL	4,955	1.7
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Physical Sciences Technologists and Technicians	295	(1.0)
Civil Engineers	115	(0.4)
Draughtsmen	205	0.5
Industrial Engineers	345	0.8
Chemists	130	2.2
Metallurgical Engineers	240	4.5
Systems Analysts, Computer Programmers and Related	305	6.0
Architectural and Engineering Technologists and Technicians	595	6.6
Mechanical Engineers	385	7.6
Electrical Engineers	120	9.1
TOTAL	2,965	2.7

TABLE D.10 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
Other Mechanics and Repairmen, n.e.c.	140	(4.4)
Other Fabricating and Assembling, Metal Products, n.e.c.	260	(1.6)
Motor-Vehicle Mechanics and Repairmen	180	1.8
Precision-Instrument Mechanics and Repairmen	150	2.7
Foremen: Mechanics and Repairmen, n.e.c.	240	5.2
Industrial, Farm and Construction Machinery Mechanics and Repairmen	3,020	5.3
Foremen: Fabricating, Assembling, Installing and Repairing, Electrical Electronic and Related	115	11.1
Electrical and Related Equipment Installing and Repairing, n.e.c.	945	11.3
TOTAL	5,575	4.5
PROCESSING		
Metal Rolling	1,100	(1.0)
Moulding, Coremaking and Metal Casting	875	(0.5)
Metal Smelting, Converting and Refining Furnacemen	1,245	0.0
Metal Heat-Treating	180	0.3
Metal Extruding and Drawing	130	2.2
Plating, Metal Spraying and Related	140	4.0
Labouring and Other Elemental Work, Mineral Ore Treating	325	4.0
Foremen, Metal Processing and Related	2,115	6.1
Foremen, Mineral Ore Treating	120	6.3
Labouring and Other Elemental Work, Metal Processing	2,420	7.6
Metal Processing and Related, n.e.c.	4,975	8.7
Inspecting, Testing, Grading and Sampling, Metal Processing	890	12.3
Crushing and Grinding, Mineral Ores	235	19.4
TOTAL	15,100	5.3

TABLE D.10 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
MANAGERIAL, ADMINISTRATIVE AND RELATED		
Accountants, Auditors and Other Financial Officers	310	1.2
General Managers and Other Senior Officials	130	2.2
Personnel and Related Officers	140	3.4
Sales and Advertising Management	150	7.2
Other Managers and Administrators, n.e.c.	195	13.5
Production Management	385	18.6
TOTAL	1,775	6.7

() Indicates decline

NOTE: Figures do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.11

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	3,600	5.3	7.1	1,470
II.	TWO DIGIT LEVEL				
	MACHINING AND RELATED	80	1.5	1.4	(5)
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	40	0.4	0.7	25
	MATERIAL HANDLING AND RELATED	85	0.4	1.7	70
	MANAGERIAL, ADMINISTRATIVE AND RELATED	155	7.0	8.7	90
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	165	1.8	5.6	125
	PROCESSING	350	0.7	2.3	280
III.	FOUR DIGIT LEVEL				
	MACHINING AND RELATED				
	Foremen, Metal Machining	0	1.1	0.0	(5)
	Machinist and Machine-Tool Setting-Up	0	0.6	0.0	(5)
	Machine-Tool Operating	5	1.2	0.9	(5)
	Foremen, Metal Shaping and Forming, Except Machining	0	2.3	0.0	(5)
	Metal Shaping and Forming, Except Machining, n.e.c.	0	5.0	0.0	(5)
	Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	10	3.7	3.6	(5)
	Forging	0	0.0	0.0	0
	Sheet-Metal Workers	10	3.0	3.0	0
	Metalworking-Machine Operators, n.e.c.	25	2.1	4.3	10
	Welding and Flame Cutting	25	0.4	1.6	20
	TOTAL	80	1.5	1.4	(5)

TABLE D.11 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Other Fabricating and Assembling, Metal Products, n.e.c	0	3.3	0.0	(10)
Precision-Instrument Mechanics and Repairmen	0	4.3	0.0	(5)
Foremen: Fabricating, Assembling, Installing and Repairing, Electrical, Electronic and Related Equipment	0	0.0	0.0	0
Foremen: Mechanics and Repairmen, n.e.c.	0	0.0	0.0	0
Motor-Vehicle Mechanics and Repairmen	0	0.0	0.0	0
Other Mechanics and Repairmen, n.e.c.	0	0.0	0.0	0
Electrical and Related Equipment Installing and Repairing, n.e.c.	10	0.0	1.1	10
Industrial, Farm and Construction Machinery Mechanics and Repairmen	20	0.0	0.7	20
TOTAL	40	0.4	0.7	25
MATERIAL HANDLING AND RELATED				
Material-Handling Equipment Operators, n.e.c.	0	0.0	0.0	0
Packaging, n.e.c.	5	4.3	4.3	0
Other Material-Handling and Related, n.e.c.	5	5.9	5.0	0
Labouring and Other Elemental Work, Material-Handling, n.e.c.	10	1.0	3.8	5
Longshoremen, Stevedores and Freight Handlers	10	0.0	3.1	10
Hoisting, n.e.c.	55	0.0	1.6	55
TOTAL	85	0.4	1.7	70

TABLE D.11 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MANAGERIAL, ADMINISTRATIVE AND RELATED				
General Managers and Other Senior Officials	0	0.0	0.0	0
Production Management	0	0.0	0.0	0
Sales and Advertising Management	5	0.0	3.3	5
Personnel and Related Officers	20	10.0	14.3	10
Other Managers and Administrators, n.e.c.	50	54.5	25.6	20
Accountants, Auditors and Other Financial Officers	50	5.5	16.1	35
TOTAL	155	7.0	8.7	90
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Physical Sciences, Technologists and Technicians	5	1.5	1.7	0
Mechanical Engineers	0	0.0	0.0	0
Civil Engineers	5	0.0	4.3	5
Electrical Engineers	5	0.0	4.2	5
Industrial Engineers	10	1.6	2.9	5
Metallurgical Engineers	5	0.0	2.1	5
Architectural and Engineering Technologists and Technicians	10	0.0	1.7	10
Chemists	15	0.0	11.5	15
Draughtsmen	20	2.6	9.8	15
Systems Analysts, Computer Programmers and Related	60	8.8	19.7	45
TOTAL	165	1.8	5.6	125

TABLE D.11 (Continued)

OCCUPATIONAL INDICATORS: IRON AND STEEL MILLS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
PROCESSING				
Metal Extruding and Drawing	0	4.8	0.0	(5)
Foremen, Mineral Ore Treating	0	0.0	0.0	0
Foremen, Metal Processing and Related	10	0.9	0.5	0
Metal Heat-Treating	0	0.0	0.0	0
Plating, Metal Spraying and Related	0	0.0	0.0	0
Metal Rolling	5	0.0	0.5	5
Crushing and Grinding, Mineral Ores	10	0.0	4.3	10
Labouring and Other Elemental Work, Mineral Ore Treating	15	0.0	4.6	15
Moulding, Coremaking and Metal Casing	25	0.5	2.9	20
Metal Smelting, Converting and Refining Furnacemen	35	0.0	2.8	35
Inspecting, Testing, Grading, and Sampling, Metal Processing	75	7.1	8.4	55
Labouring and Other Elemental Work, Metal Processing	60	0.4	2.5	55
Metal Processing and Related, n.e.c.	100	0.7	2.0	85
TOTAL	350	0.7	2.3	280

() Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total. Figures do not add to totals as all occupations are not included.

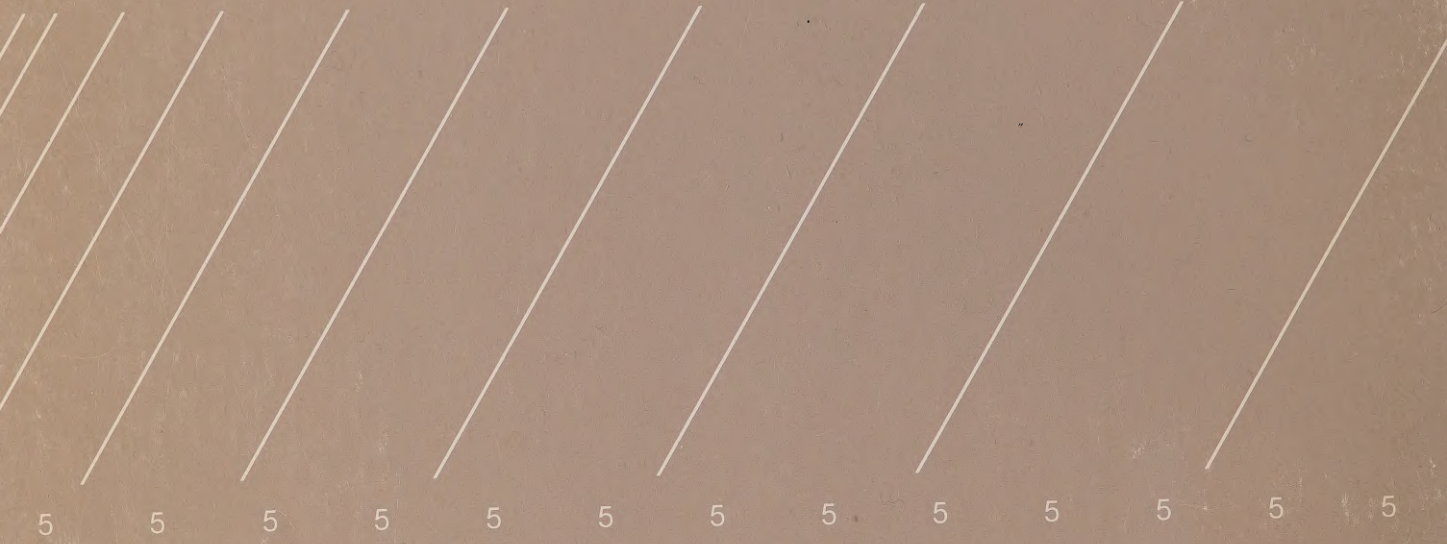
SOURCE: Census data, Ontario Ministry of Labour

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy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